



# SYSTEMS ENGINEERING Research Center

## Technical Leadership Development Program- Year 4

Final Technical Report SERC-2013-TR-013-4

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## ABSTRACT

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In 2009, the Defense Acquisition University (DAU) contracted with the Systems Engineering Research Center (SERC) for Research Task 4 (RT-4) to conduct research and development for a proposed Systems Engineering (SE) technical leadership course (SYS 350) to accelerate technical leadership development of Systems Planning, Research, Development, and Engineering (SPRDE) senior level systems engineers. The RT-4 project developed a prototype leadership course, designated by DAU as SYS350, that is comprised of three 5-day course modules or lenses designated as the SYS350A Systems lens, the SYS350B Business lens, and the SYS350C Enterprise lens.

In Year 2 of the RT-4 task, the SERC research team developed the prototype 5-day course module for the SYS350A course module or lens. Two SYS350A Systems lens pilot courses were conducted resulting in student feedback evaluation of the course and the instructors. The SYS350A feedback provided the foundation for subsequent SYS350B and SYS350C course research and development. In Year 3 of the RT-4 task, the SERC team revised portions of the baseline SYS350A course prototype and conducted a second SYS350A student pilot, developed prototypes SYS350B and SYS350C modules and conducted two 350B and two 350C pilots.

As a result of the analysis of feedback data compiled over the course of seven SYS 350 pilot modules, seven recommendations were developed by the SERC RT4 research team to support transition of the prototype SYS 350 course to DAU.

1. Student Course Expectations and Cohort Size: The recommended cohort size should range from twenty to twenty-five students.
2. Course Development Approach: An Objective or Focus Area approach is recommended for initial course prototyping. A Seminar or Plenary approach is recommended for post-prototype refinements and sustainment.
3. Technical-Behavioral Course Content Ratio and Integration: A 30% Leadership Thread-Technical course content ratio is a recommended starting point.
4. Group Project: Technical leadership simulations requiring decision and illustrating consequence are recommended as the Group Project for refinements to all three SYS 350 prototype modules.
5. SYS350A Readiness: The prototype SYS350A is ready for transition to DAU.
6. SYS350B Readiness: The prototype SYS350B course is in need of a design iteration and third student pilot trial.
7. SYS350C Readiness: The prototype SYS350C course is in need of a design iteration and third student pilot trial.

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# 1 EXECUTIVE SUMMARY

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In 2009, the Defense Acquisition University (DAU) contracted with the Systems Engineering Research Center (SERC) for Research Task (RT-4) to conduct research and development of a proposed SE technical leadership course to accelerate the professional development of SPRDE systems engineers by way of providing leadership insights into SE activities and issues at the system, business, and enterprise levels. The potential leadership course was designated SYS 350 by DAU.

In Year 2 (Y2) of RT-4, the team developed a proposed three 5-day course modules for SYS 350 comprised of Systems lens (SYS350A), Business lens (SYS350B), and Enterprise lens (SYS350C) modules. During Y2, the SERC RT-4 team conducted two Systems lens (SYS350A) pilot courses and initiated content development for the Business lens (SYS350B) pilot course. Subsequent to iterative SYS350A course development, two pilot 350A courses were conducted with two cohorts; Cohort 1 was comprised of senior Office of Secretary of Defense (OSD) and DAU teaching faculty and Cohort 2 was conducted with representative operational US Army Systems Engineers. Feedback from both student and DAU instructor pilots was leveraged to research and develop the SYS350B and SYS350C course modules.

In Year 3 (Y3) of RT-4, the team updated the SYS350A pilot course material and a second student pilot was conducted at DAU-South in Huntsville, Alabama. The Y3 SYS350A was well received by the third participating cohort and to that end, SYS350A is considered ready for DAU transition in 2013. The SYS350B business lens module was developed based on the technical and leadership focus areas developed in Y2; Business Strategy; Technology and Innovation Management; Financial Acumen; and Leading and Influencing Teams. SYS350C was also developed in Y3 where seven enterprise focus areas provided the technical foundation elements for the syllabus and were coupled with four leadership focus areas. For each of these two lenses, the SERC RT4 team developed a complete set of storyboards for each syllabus segment, syllabus, pre-reading material, course lectures, case studies, leadership thread intervention exercises, and guidelines for the courses.

As a result of the observation and feedback data compiled over the course of seven SYS 350 pilot modules, the RT4 team has developed seven recommendations to support transition of the prototype SY 350 course to DAU. The summary recommendations are:

1. Student Course Expectations and Cohort Size: Student selection, learning expectations, and the syllabus should be prescribed and agreed to by the sponsoring organizations. It is additionally recommended that consideration be given to requiring candidate students submit their desired expectations and professional reasons for attendance as part of their selection process to better frame

expectations. The recommended student cohort size should range from twenty to twenty-five

2. **Course Development Approach:** The use of objectives or focus areas approaches for first time course prototyping should be ensued to ensure initial alignment with the desired course objectives and to identify strengths, weaknesses, and opportunities through cohort test. The seminar or plenary approach, with its inherent robustness to changing course materials, delivery modalities, and guest speaker accommodation should be used for course refinements and sustainment.
3. **Technical-Behavioral Course Content Ratio and Integration:** Technical Leadership education is, on balance, a behavioral educational experience for those with demonstrated technical expertise and high potential for increased organizational responsibilities. A minimum of a 30% Leadership Thread-Technical course content ratio is a recommended starting point for future technical leadership course developments or updates.
4. **Group Project: Simulation vs. Strategy Development:** It is recommended that leadership simulations requiring decision and illustrating consequence be the preferred group project approach for all three SYS 350 modules.
5. **SYS350A Readiness:** SYS350A, with minor changes to its current form, is recommended for transition to the DAU portfolio of systems engineering courses.
6. **SYS350B Readiness:** SYS350B in its current state is not recommended for transition to DAU. Three SYS350B redesign approaches are recommended for consideration; Refinement of the current 350B pilot baseline, Focus Area Modification, or Focus Area Change. Subsequent to additional design iterations, it is recommended that a second student pilot be conducted.
7. **SYS350C Readiness:** SYS350C in its current state is not recommended for transition to DAU. Four SYS350C redesign approaches are recommended for consideration; Refinement of the current 350C pilot baseline, Focus Area Reduction, Seminar, or Case Study. Subsequent to additional design iterations, it is recommended that a second student pilot be conducted.

## 2 BACKGROUND

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The Department of Defense (DoD) is continually working to improve acquisition program performance by<sup>1</sup>:

- Better equipping/supporting/enabling the SPRDE workforce to perform successfully and meet all demands,
- Mitigate loss of skilled/experienced workforce,
- Successfully compete for, hire and retain talent,
- Transfer knowledge/expertise to new generation,
- Integrate acquisition workforce planning with DoD Total Force Human Capital Planning, and
- Strategically plan and resource human capital initiatives.

The DoD also continues to sustain and grow its science, technology, engineering, and mathematics (STEM) workforces in support of acquisition excellence. In 2006 the DoD released its Civilian Human Capital Strategic Plan<sup>2</sup> with the goal of developing, “a civilian workforce that possesses the leadership, competencies, and commitment necessary for successful mission accomplishment.” Thus, under this backdrop, research was conducted in Year 1 to develop a framework for the competencies necessary for the technical leadership workforce.

Developing a concise and universally accepted definition of leadership for people involved in technical engineering management is difficult. For example, Rost (1991) analyzed 221 definitions of leadership in an effort to develop a meaningful definition. Most definitions share several common features—leadership is an interpersonal influence process that is goal-directed and purposeful. Leadership is defined as “the process of influencing an organized group toward accomplishing its goals” (Farr, et al, 1997). For this project, “technical leadership” is defined as motivating and guiding a group of technical professionals to define and deliver constructive change producing new technical performance or systems. To develop a senior technical leader requires many years of experience leading to the completion of many complex projects encompassing multiple jobs involving many programs. Within the DoD, long program life cycles, competition for human capital, acquisition reform, and the scale of projects within the defense community has led to a need for senior technical leaders with sound SE<sup>3</sup> and technical project

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<sup>1</sup> Taken from a briefing by Gordon Kranz, DUSD(A&T)/SSE Director, Technical Management Functional Leader, “Human Capital Strategy and Planning for SPRDE-SE & PSE, DT&E, and PQM,” <https://acc.dau.mil/GetAttachment.aspx?id=280166>, August 28, 2009

<sup>2</sup> This report can be accessed at <http://www.cpms.osd.mil/ASSETS/A48A22FD8C0347FCAF182758F283A450/DoDCivilianHumanCapitalStrategicPlan2006-2010.pdf>.

<sup>3</sup> Numerous definitions of SE exist. The DoD has adopted the following formal definition, derived from Contract Number: H98230-08-D-0171

leadership skills. As a result, it is important to develop capable senior technical leaders with sound engineering skills and an ability to think and act holistically. Technical leaders should be systems thinkers and understand systems-of-systems (SoS) and enterprise issues in addition to traditional tenets of leadership and management. Research is needed to synthesize and validate curriculum content and structure for a program to develop future DoD senior technical leaders.

In support of educating the DoD acquisition workforce, the Defense Acquisition University (DAU) provides practitioner training, career management, and services to support the majority of the Acquisition, Technology, and Logistics (AT&L) community. Currently the SPRDE career field is the largest<sup>4</sup>. Within the SPRDE career field, DAU currently offers Level I, II, and III certifications in Science and Technology Management (S&TM) and Systems Engineering (SE) career paths. The RT-4 focus is on the SPRDE-PSE and SPRDE-SE career fields.

RT-4 supports and extends the educational elements of SPRDE-SE certification offered by DAU at Level III. The research is needed to develop, synthesize and validate curriculum content, course materials, and structure for a program to support the development of future DoD senior and executive SE and technical leaders.

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## 2.1 REVIEW OF YEAR 1 AND YEAR 2 WORK

In 2009, DAU contracted with the Systems Engineering Research Center (SERC) to develop a curriculum for technical leadership. The purpose of the work was to thoroughly research the state-of-the-art and best practices associated with technical leadership education and to incorporate these best practices, along with the experience of the SERC collaborators, into a technical leadership course which would specifically focus on technical leadership in systems engineering (SE). This report presents the research, development, findings, and recommendations of RT-4 Year-3.

During the planning stages of RT4 project, SE competency topics and elements were collected from a wide variety of sources, including NASA<sup>5</sup>, Nokia, BAE Systems, the DoD, and the Australian government to develop an initial competency model. These models were discussed

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ANSI/EIA/IS 632, *Processes for Engineering a System*. "Systems engineering is an interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and total life cycle balanced set of system, people, and process solutions that satisfy customer needs. SE is the integrating mechanism across the technical efforts related to the development, manufacturing, verification, deployment, operations, support, disposal of, and user training for systems and their life cycle processes. SE develops technical information to support the program management decision-making process."

<sup>4</sup> Technical Management (TM) workforce is 41% or 36,704 employees in 2009 of the total acquisition population and includes systems engineering, developmental test and evaluation, and production, quality and manufacturing. All of the TM workforce would be interested in Level IV training.

<sup>5</sup> Compiled by Wiley Larson and titled NASA's Systems Engineering Competencies as part of the Academy of Program/Project and Engineering Leadership for NASA, 2006.

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in deliverable A0009. From these competency models, possible competencies for SPRDE Level IV were identified<sup>6</sup>.

In summer 2010, the RT-4 Technical Leadership Program (TLP) development team discussed a possible architecture with DAU representatives. This architecture, shown in Figure 1, is based on the principles that there are three lenses that can be used to view technical leadership course content. The lenses open an increasing aperture on a specific area, in this instance SE technical leadership.

The SYS350 program is a multi-disciplinary, experiential post graduate and professional development curricula that supports the preparation of senior design engineers, system engineers, and technologists for expanded technical leadership roles and responsibilities including Chief Engineer, Technical Director, and Enterprise Technical Executive positions through an interactive course of independent study, simulation, and case study through the three focused lenses: systems, business, and enterprise. These lenses were designated SYS350A, B, and C, respectively, by DAU.

Using the architecture, lens learning objectives, desired outcomes, and focus areas were identified. The focus areas were populated with a draft list of topics. Current related courseware was compared to the topical outline for each lens to identify areas where materials exist that could be tailored to support the DAU TLP model.

The targeted learner group is high potential senior systems engineers and technologists with demonstrated superior domain engineering or technology expertise that have been identified and recommended as advanced technical leadership candidates in their organization or fields of expertise.

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<sup>6</sup> The term "Level IV" is used throughout this report as defined in Table 1.8. SYS 302 should focus on developing Level III proficiencies, whereas SYS 351 should be mainly focused on developing professionals who oversee SE activities for a program with several systems and/or establishes SE policies at top organizational level. It should be noted, however, that the SYS350 series does not technically constitute "Level IV" at this time.



Figure 1. Baseline Architecture Developed during Base Year.

At the beginning of Year 2, the RT-4 team developed a roadmap for the development, delivery, and refinement of course materials for the SYS350A systems lens. In addition, the team completed preparatory work to lay the foundation for the business and enterprise lenses (350B and 350C, respectively), which were developed in Year 3 (see Sections 3 and 4).

The RT-4 team developed a set of working definitions for technical leadership (TL) and a framework for discussing how leadership actions in a technical environment might differ from and also align with successful leadership practices from other disciplines. These were presented to DAU, refined, and supported the foundation for the SYS 350 courses.

In Year 2, the team further reviewed the draft architecture from Year 1; validated that the three-lens approach remained an appropriate framework for development; and refined the architecture to include updated focus areas for each lens.

Using the architecture, the team developed a series of course descriptions to outline the goals, objectives, and key activities of each of the lenses. This was delivered to DAU in June 2011.

The team utilized the architecture framework and SYS350A focus areas to identify key syllabus segments for SYS350A. The team then developed design review materials, termed Storyboards, to support a high-level design review of the planned SYS350A segments. The SYS350A storyboards were then reviewed by a DAU-SERC red team in August 2011 and set the design baseline for the SYS350A instructor pilot. A SYS350A instructor pilot with sponsors from DASD/SSE and faculty/researchers from DAU LCIC, CNE, DAU Mid-West Region, DAU South Region, DAU Mid-Atlantic Region, and DSMC was conducted 26-30 September 2011. Based on feedback from this instructor pilot, course syllabus, teaching materials, and technical leadership learning emphasis were iterated resulting in a student pilot version in preparation for the first student SYS350A pilot. The SYS350A student pilot, consisting of US Army engineering professionals from RDECOM, TARDEC, ECBC, Aviation MRDEC, Army Power, and the Chemical Material Agency, was conducted from 14-18 November 2011 at the US Army APG, MD.

The team provided an initial approach, architecture, and materials for SYS350B to DAU on 12 December 2011.

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## 2.2 PURPOSE OF REPORT

Based on the work from the Years 1 and 2, DAU chose to exercise its option and continue the research for Year 3, the primary purpose of which was to develop curriculum materials for the SYS350B business lens module, develop a recommended approach and curriculum materials for SYS350C enterprise lens, deliver pilots for the SYS350A to student pilot, SYS350B and SYS350C to an instructor cohort and an operational SPRDE student cohort, and collect and analyze feedback from the student pilots.

This report details the RT4 research and findings over the period from 1 March 2012 to 28 Feb 2013 that supported six primary deliverables:

1. a SYS350A Systems Lens Student Pilot conducted at DAU-South in Huntsville, AL from April 16-20, 2012;
2. a SYS350B Business Lens Instructor Pilot conducted at DAU, Ft Belvoir, VA from May 14-18, 2012;
3. a SYS350B Business Lens Student Pilot conducted at Harford Community College in Bel Air, MD from June 4-8, 2012;
4. a SYS350C Enterprise Lens Instructor Pilot conducted at DAU, Ft Belvoir, VA from October 1-5, 2012;
5. a SYS350C Enterprise Lens Student Pilot conducted at the C4ISR Training Center on Aberdeen Proving Grounds at Aberdeen, MD from November 5-9, 2012;
6. a final set of feedback, recommendations, and materials for the SYS 350 series.

This report addresses items 1-5, feedback and recommendations in item 6; materials for the SYS 350 series will be delivered separately.



## 3 RT-4 YEAR 3 OVERVIEW

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This section provides a brief overview of the work from Year 3. The following sections provide additional detail.

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### 3.1 REVIEW OF SYS350A STUDENT PILOT 2

A second SYS350A Systems Lens Student Pilot was conducted at DAU-South, Huntsville, AL from April 16-20, 2012 with 30 students representing Redstone Arsenal tenant commands. Materials from the first SYS350A Student Pilot conducted at Aberdeen Proving Ground (APG), MD were updated for presentation to the student cohort in Huntsville, with only minor modifications. The pilot consisted of 22 modules, including lecture, case study, leadership, and project segments.

Instructor and course evaluations were conducted via specific questions and solicited comments and students were asked to assign 'Strongly Disagree', 'Disagree', 'Neither Agree nor Disagree', 'Agree', or 'Strongly Agree' ratings.

- 100% of the students strongly agreed that the instructors had command of their subject, were effective teachers, and were prepared for class.
- Over 90% of the students strongly agreed that the course was excellent, was structured to facilitate discussion and student participation, would enable them to enhance their career objectives, could apply the learning to current and future projects, that the subject matter had significant usefulness to their organization and that the instructors successfully communicated their subject.
- Those areas rated less than optimal included allotting enough time to cover the material, clearly stating the objectives of the course, and the organization of the course material.

The size and breadth of this student cohort presented instructor challenges with respect to homogeneous course objectives, course balance of lecture, case study, and exercises, and delivering the desired material in the allotted time. Nonetheless, the summary Huntsville student feedback was similar to that found with the fall, 2011 APG student cohort; that the course was an excellent course and that they could apply the learning to current and future projects.

Additional detail on the feedback can be found in Appendix D.

## 3.2 ALIGNMENT OF COMPETENCIES (A-C)

The seventy-five technical leadership competencies<sup>7</sup> catalogued as Systems, Business, and Enterprise competencies developed during earlier research including collaborative Delphi sessions of government, industry leaders, and SERC collaborators served as a framework for review of the developing and final pilot course content. In Year 2, the RT-4 team developed a mapping of the competency model against the three lenses. Throughout the project in Year 3, the RT-4 team examined the competency model against the course objectives and the materials covered in the lenses. (Note: Within the catalogued competencies, Business Acumen, Resource Management, Enterprise Leadership, and Professional Leadership competencies to include leadership, communications, ethics, mentoring and coaching, team dynamics and management, and multinational and multicultural issues were noted as higher importance with respect to technical leadership.)

At the completion of the RT4 pilots, a subjective ‘competency alignment’ analysis was performed on pilot course material, course objectives and outcomes. The purpose of the analysis was to identify competencies that were most frequently addressed and those that were minimally addressed. As developing a quality metric based on topical competency frequency is not viable, there was no intent to measure value or quality of the addressed competency but rather assess which competencies had high relevance and those that were not addressed to a large degree in the presented lectures, case studies, exercises, and group projects. Additional detail on the competency alignment can be found in Appendix D.

**SYS350A Systems:** Of the thirty-five Systems competencies<sup>7</sup>, all were addressed with significant frequency with the exceptions of Operations, Technical Data Management, Process Assessment and Control, Interface Management, and Configuration Management. As these competencies are more indicative of systems engineering process, their infrequent reference is deemed more a result of the 350A emphasis on emergent environments and technical leadership in the face of uncertainty and ambiguity as opposed to deficient course alignment.

**SYS350B Business:** Of the twenty-five Systems Business competencies<sup>7</sup>, all were addressed with significant frequency with the exceptions of Mission Assurance, Tracking/Trending of Project Performance, Lifecycle Cost Estimating, Project Control, Contract Management, Project Review and Evaluation, and Budget and Full Cost Management. Again, as in the case of 350A, as these competencies are more indicative of management processes, their infrequent reference is deemed more a result of the SYS350B emphasis on understanding how business operate and the strategic emphasis on developing enhanced technical buying power initiatives as opposed to deficient course alignment

<sup>7</sup> RT4 Year 1 Final Report, December, 2010

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**SYS350C Enterprise:** Of the fifteen Enterprise competencies<sup>7</sup> Leading the Technical Enterprise, Organizational Structure Mission and Internal Goals, and Leadership were addressed with significant frequency. Given that a major objective of SYS350C was to explore how enterprise technical leaders approach their roles and responsibilities as well as introducing methods to characterize enterprise behaviors, the population of these referent competencies appears orderly.

Even though competency alignment is subjective, it provides a preliminary assessment of the frequency at which the competencies are covered in each course. The most frequent competencies are covered within the core topics of each course, which is an indication that course objectives were closely aligned with course lecture material. An objective assessment of competency alignment, including investigating potential quantitative metrics could be considered for future curriculum research.

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### 3.3 APPROACH TO SYS350B

For SYS350B, the RT-4 team began development by examining the focus areas developed during Year 2 and concluded with the following focus areas:

- Business Strategy
- Technology and Innovation Management
- Financial Acumen
- Leading and Influencing Teams

The team developed materials to support each of these lenses (full agenda is discussed in Section 4). In addition, the team developed a student project for the pilot. This project was developed for students acting in groups and focused on the development of a technical buying power initiative.

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### 3.4 APPROACH TO SYS350C

For SYS350C, the RT-4 team began development by examining the focus areas developed during Year 2 and determined that there was a more appropriate approach. This approach is depicted in Figure 2. The materials were developed around these 7 focus areas; while different in structure, these focus areas align with the initial planning for SYS350C.

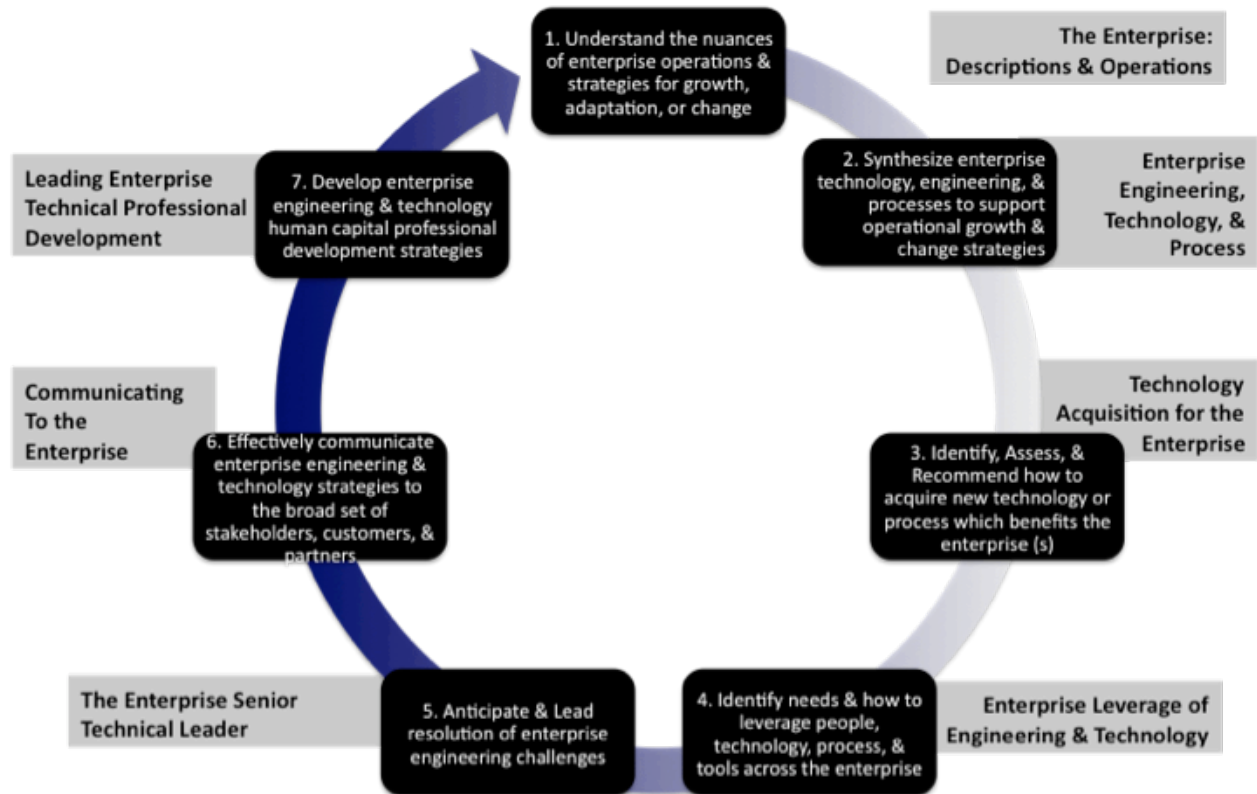


Figure 2. Focus areas for SYS350C.

The team developed materials to support each of these lenses (full agenda is discussed in Section 5). In addition, the team developed a student project for the pilot. This project was developed for students acting in groups and focused on the development of an enterprise-level initiative to bring about a needed change.

### 3.5 CATALOGUE OF COPYRIGHT AND INTELLECTUAL PROPERTY ITEMS FOR THE SYS 350 SERIES

A variety of materials were used for the SYS 350 series, including images, figures, diagrams, tables, videos, and readings. To ensure that DAU understands the appropriate uses, the RT-4 team has developed a complete catalogue of these materials. These items are grouped into the following categories:

1. **Created for RT-4** – These materials were created specifically for RT-4; there are no restrictions on their usage. Some images were created for RT-4 based on information from other sources; in these instances, the references are included in the pilot materials.
2. **Fair Use** – These materials are copyright owned, but may be presented in classroom materials under the restrictions of Fair Use. These materials fall under the Stevens

Institute of Technology policy of Fair Use; DAU must determine whether these items also fall within their institutional Fair Use policies.

3. **Public Domain** – These items fall within the Public Domain. These are generally either created by US government agencies or are works for which the copyright has expired.
4. **Permission Required** – These materials are copyright owned and do not fall within the tenets of Fair Use. There are subcategories:
  - a. **Permissions transferred to DAU** – materials created within Stevens Institute of Technology; permission to use will be transferred along with the materials.
  - b. **Permissions to be Purchased** – payment to the copyright owner (either for the item itself or materials containing the IP items) required. Once purchased, item can be used in all classes. Purchase instructions and costs are documented for these items.
  - c. **Permissions to be Requested** – written permission must be requested by DAU.

Sources are identified for all items. For the items that require permission, the RT-4 team will assist in DAU obtaining permission as appropriate.

The complete catalogue will be delivered to DAU with all of the materials (SERC-2013-TR-013-4(A)). A summary of the IP inventory can be found in Table 1, below.

**Table 1. Summary of IP and Copyright Items for SYS 350**

	Images			Videos	Handouts	Totals
	350A	350B	350C			
Created for RT-4	73	61	65	0	2	<b>201</b>
Fair Use	184	92	135	19	0	<b>430</b>
Public Domain	4	6	3	0	0	<b>13</b>
Permission Required	20	119	47	6	18	<b>210</b>
Source information needed	3	0	0	1	0	<b>4</b>
<b>Totals</b>	<b>284</b>	<b>278</b>	<b>250</b>	<b>26</b>	<b>20</b>	
<b>Grand Total</b>						<b>858</b>

## 4 SYS350B DEVELOPMENT

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The RT-4 team developed the SYS350B architecture as shown below. The black circles represent the focus areas for the lens. Through the focus areas, students would develop a basic understanding of how businesses operate and how they might be used within DoD to enhance technical buying power. This understanding would be paired with the “Leading and Influencing Teams” thread to support the development of the student project (shown in blue in Figure 3).



Figure 3. Architecture for SYS350B

### 4.1 DEVELOPMENT

Using the SYS350B focus areas as a content-development framework, the RT-4 team developed a detailed syllabus for the SYS350B pilot with specific learning modules and allocated times. These were reviewed with DAU at the December 2011 IPR and updated based on discussion. These materials formed the basis for SYS350B course content development.

The team then developed a complete set of storyboards – descriptions and learning objectives – for each segment of the syllabus. These storyboards were also reviewed with DAU and were included in the Year 2 final report (SERC-2012-TR-034-1). Each focus area was covered by a combination of lecture segments, leadership thread interventions with a specific focus on non-technical leadership skills, and case studies. In addition, the students were allowed class time each day to address the project, which was focused on the development of an initiative to improve the technical buying power of a specific aspect of their organization’s operations.

Using the iterated version of the syllabus and the storyboards, the RT-4 team developed draft materials for each course module. These materials were used to deliver the SYS350B instructor pilot, which was conducted at the DAU campus on Ft. Belvoir, VA from 14-18 May 2012.

The initial pilot syllabus was reviewed after completion of Pilot 1 and updated based on the feedback gathered at the workshop (see Section 4.3, below, for additional detail). The final SYS350B Pilot 2 syllabus, which outlines the modules delivered during the student pilot conducted at Harford Community College in Bel Air, MD.

For each module, the RT-4 team developed specific materials:

- Lectures – Each lecture is supported by a slide deck, which includes lecture notes.
- Case Studies – Each case study was provided to students as either part of pre-reading or handed out in class; they are accompanied by slides to support class discussion.
- Thread Interventions – Each thread has supplemental materials, including student self-assessments, as well as a slide deck for presentation in the course.
- Project – The students are provided guidance on the project, but students produce their own artifacts for the project.

All materials that were developed for RT-4 will be provided electronically to DAU in conjunction with this report.

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## 4.2 DELIVERY

The SYS350B Business lens Red Team Review was conducted at DAU, Ft Belvoir, VA on 13 Apr 2012.

The SYS350B instructor pilot was conducted at the DAU campus on Ft. Belvoir, VA from 14 – 18 May 2012. The instructor pilot was attended by twelve individuals, including instructors from DAU and representatives from the Office of the Secretary of Defense (OSD).

The SYS350B student pilot was conducted at Harford Community College, Bel Air, MD from 4 - 8 June 2012. Thirteen systems engineers from various US Army commands from the Aberdeen Proving Ground, MD area and MDA with experience ranging from 4 to 30+ years participated in this student pilot course. Seven of the 350B students had also attended the SYS350A student pilot.

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## 4.3 OVERVIEW OF PILOT FEEDBACK

The SYS350B Business lens student pilot focused on leadership at the business level; providing insights developing a business strategy; creating value; developing technology strategies in alignment with business strategies; understanding financial statements; and understanding how business operations interact with government acquisition efforts. For the instructor pilot,

100% of the participants agreed that the instructors had command of their subject. However, the student pilots showed significant data variance from the SYS350B instructor pilot in specific areas noted below:

- Feedback on the instructor pilot showed that, on average, 70% of the DAU instructors participating strongly agreed that the course was an excellent course, would enable them to enhance their future careers, could apply the learning to current and future projects, had relevant and useful subject matter, and that the course was structured to facilitate discussion and student contribution. However, less than 45% of the student pilot cohort strongly agreed on these items.
- Approximately 75% of the cohort for the instructor pilot strongly agreed that the instructors were effective teachers; only 36% of the student cohort strongly agreed.
- As in the case of the SYS350B instructor pilot and the SYS350A Huntsville student pilot, those areas rated less than optimal included allotting enough time to cover the material, clearly stating the objectives of the course, and the organization of the course material. It was concluded that these particular evaluations were reflective of the prototype nature of the pilots and will be improved over the course of improved packaging and delivery.

The SYS350B cohort was less than half the size of the Huntsville SYS350A cohort. Based on in-situ observations of the SYS350B and previous SYS350A student pilot class dynamics and interaction, direct correlation of class size to the numerical course evaluations cannot be discerned. However based on augmenting the numerical feedback data with observation, there appears to be a correlation between experience level and expectations and course evaluation. To that end, as technical leadership courses proceed outside the normal technical operating point of systems engineers towards the operating points of awareness, analysis, and decisions when collaborating with the broader representations of USG programs and industry, sensitivity to the impact of cohort homogeneity, expectations, and professional development needs appear to be important considerations when structuring a SYS350B Business course. Please refer to Section 5 for more feedback detailed analysis.



## 5 SYS350C DEVELOPMENT

The RT-4 team developed the SYS350C architecture as shown below. This cycle represents a top-down enterprise technical leader approach to developing roles and responsibilities as well as the iterative approach agreed to by the RT-4 team as an appropriate method for approaching enterprise change and, later, assessing that change.

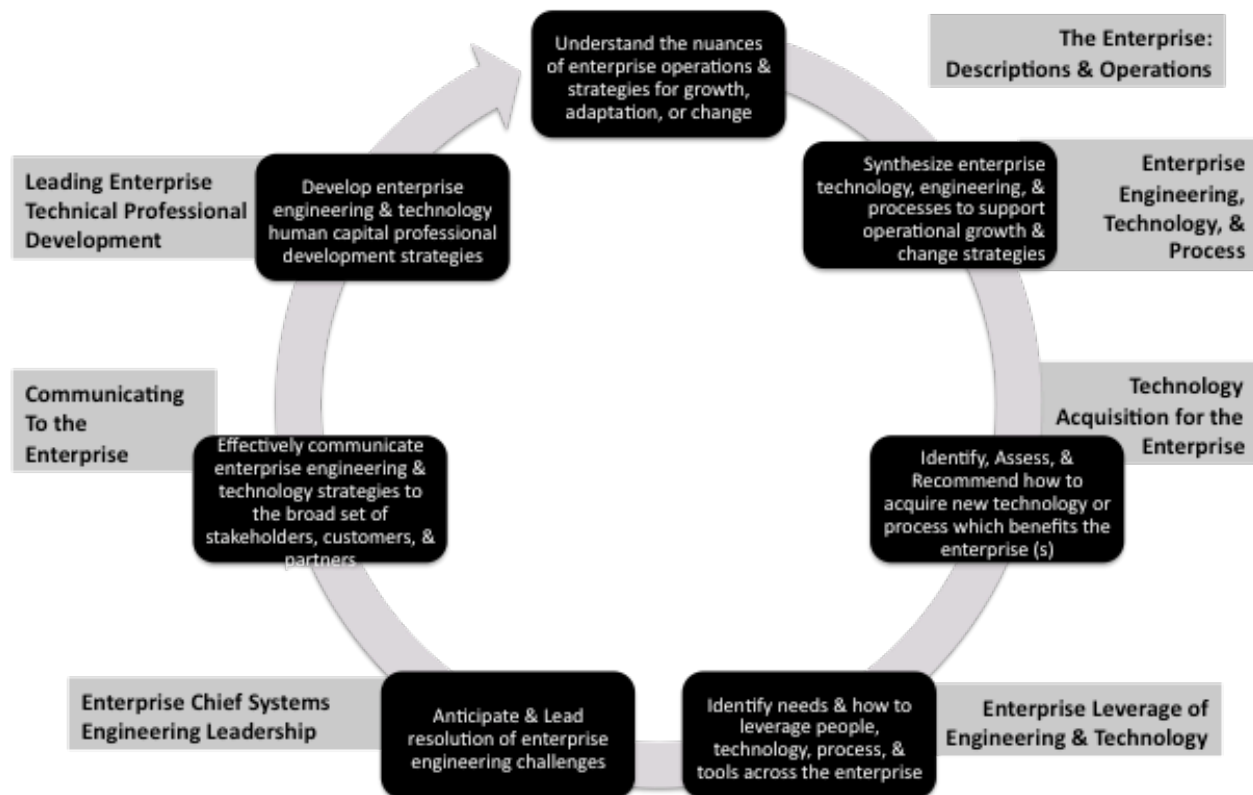


Figure 4. Architecture for SYS350C

### 5.1 DEVELOPMENT

Using the SYS350C architecture as a content-development framework, the RT-4 team developed a detailed syllabus for the SYS350C pilot with specific learning modules and allocated times. Subsequently, the team developed a detailed syllabus for the SYS350C pilot with specific learning modules and allocated times. These were reviewed with DAU in September 2012 and updated based on discussion. These materials formed the basis for SYS350C course content development.

The team developed a complete set of storyboards – descriptions and learning objectives – for each segment of the syllabus. These storyboards can be found in Appendix F. The pilot materials consisted of a combination of lecture segments, leadership thread interventions (specific focus on non-technical leadership skills), and case studies. In addition, the students were allowed in-class time each day to address the project, which was focused on the development of an enterprise-level initiative to bring about a needed change.

Using the iterated version of the syllabus and the storyboards, the RT-4 team developed draft materials for each course module. These materials were used to deliver the SYS350C instructor pilot conducted at the DAU campus on Ft. Belvoir, VA from 1-5 October 2012.

The initial syllabus was reviewed after completion of the SYS350C instructor pilot and updated based on the pilot feedback (please see Section 5.3, below, for additional detail). The final SYS350C student pilot (Pilot 2) syllabus outlines the modules delivered during the student pilot conducted at Ft. Belvoir, Aberdeen, MD.

For each module, the RT-4 team developed specific materials:

- Lectures – Each lecture is supported by a slide deck, which includes lecture notes.
- Case Studies – Each case study was provided to students as either part of pre-reading or handed out in class; they are accompanied by slides to support class discussion.
- Thread Interventions – Each thread has supplemental materials, including student self-assessments, as well as a slide deck for presentation in the course.
- Project – The students are provided guidance on the project, but students produce their own artifacts for the project.

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## 5.2 DELIVERY

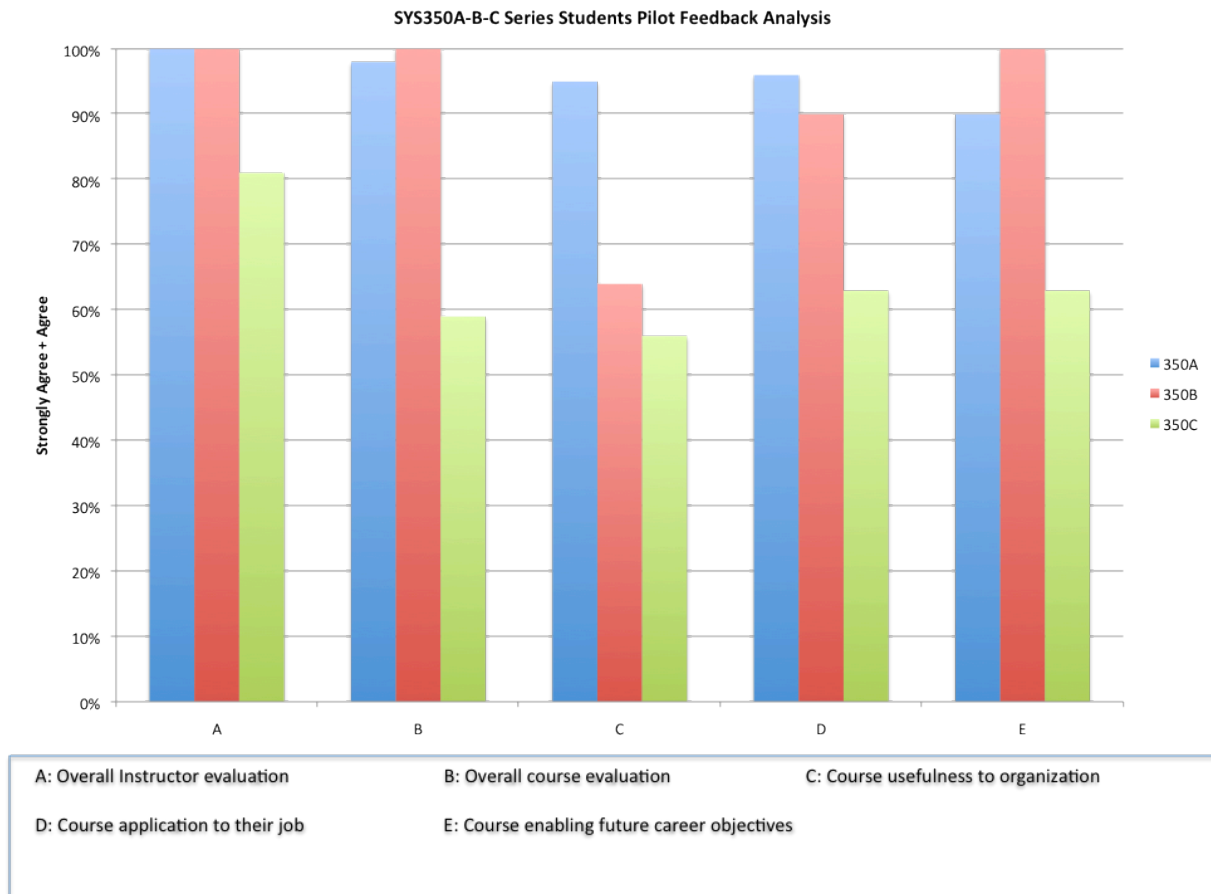
The SYS350C Enterprise Lens Red Team was conducted on 5 September 2012 at DAU, Ft Belvoir, VA.

The SYS350C instructor pilot was conducted at the DAU campus on Ft. Belvoir, VA from 1 – 5 October 2012. The instructor pilot was attended by twelve individuals, including instructors from DAU and representatives from the Office of the Secretary of Defense (OSD).

The SYS350C student pilot was conducted at the C4ISR Training Center, APG MD from 5 – 9 November 2012. The student cohort of twenty-eight systems engineers represented various US Army commands from the Aberdeen Proving Ground, MD and the MDA. Twelve of the SYS350C students had attended SYS350A, nine had attended SYS350B, and nine had attended both SYS350A and SYS350B student pilots.

### 5.3 OVERVIEW OF PILOT FEEDBACK

The SYS350C Enterprise lens student pilot focused on technical leadership of the organizational and activity-based enterprises, defining the technical enterprise, and discussion of enterprise operations with emphasis on enterprise strategy, engineering, and technology. Additionally, enterprise senior technical leader competencies with respect to communicating with the enterprise, building enterprise technical readiness, and leading enterprise adaptation comprised the leadership focus areas. Figure 5 illustrates the student pilot feedback analysis data for the three lenses.



**Figure 5. Course Evaluations for 350A-C (Strongly Agree and Agree).**

- SYS350C instructor and student pilot numerical evaluations of both instructors and the course exhibited a downward trend from the SYS350A and SYS350B data. Additionally, there was broader variance between the SYS350C instructor and student pilot feedback than that found between the SYS350A or SYS350B instructor and student pilots.
- The SYS350C DAU instructor pilot feedback showed 100% of the participants strongly agreed that the SYS350C instructors had command of their subject;

however, 54% of the student pilot participants strongly agreed with that premise.

- 100% of the participants in the instructor pilot strongly agreed that the instructors were prepared for class, presented their material in an organized manner, and successfully communicated the subject material. An average of only 33% of the student pilot participants strongly agreed with those statements.
- Whereas 83% of the DAU instructors strongly agreed that the SYS350C instructors were effective teachers, 29% of the students in the student pilot agreed with that premise.
- On average, 58% of the SYS350C instructor pilot cohort strongly agreed that the course would enable them to enhance their future careers, could be applied to current and future projects, had relevant and useful subject matter, and that the course was structured to facilitate discussion and student contribution. 28% of the student pilot cohort strongly agreed with these statements.
- In addition, 58% of the instructors strongly agreed that the instructors were effective teachers as opposed to the student pilot where 32% of the students strongly agreed.
- As in the case of the previous SYS350A and SYS350B pilots, those areas rated less than optimal included allotting enough time to cover the material and the organization of the course material. As was the case for the previous pilots, it was concluded that this particular evaluation was reflective of the prototype nature of the pilots and will be improved over the course of improved packaging and delivery.

SYS350A and SYS350B evaluations were more positive by both students and DAU instructors compared to SYS350C.. The project findings show that the SYS350C student cohort was twice the size of the SYS350B student cohort and approximately the same size as the Aberdeen and Huntsville SYS350A student cohorts. Based on in-situ observations of the SYS350C and previous SYS350A/B student pilot class dynamics and interaction, direct correlation of class size to the numerical course evaluations cannot be discerned. However based on feedback data analysis there appeared to be a correlation between leadership experience level, student expectation, and course evaluation as cited above. To that end, it was again concluded that as technical leadership courses proceed outside the normal technical operating point of systems engineers towards the operating points of awareness, analysis, and decisions when collaborating with the broader representations of US Government (USG) and industry enterprises, sensitivity to the impact of cohort homogeneity, expectations, and professional development needs appear to be important considerations when structuring a SYS350C Enterprise course. For more details please refer to Section 6.

## 6 CONCLUSIONS

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### 6.1 RESULTS

Background: Over the three-year span of research, the RT-4 project generated over 65 prototype technical leadership learning segments that were tested through the course of seven individual five-day pilots. The 65 prototype segments represented 12 technical and 10 leadership thread focus areas that gave rise to over 3,900 hours of faculty-student contact hours. Faculty and student feedback evaluations on both course and DAU instructors were additionally obtained and, when superposed with faculty-student contact hour findings, represent a broad set of prototype course data for iterative refinement and subsequent SYS 350 baseline for DAU.

#### 6.1.1 DEVELOPMENT

SYS350A-C pilot course development shared the common assumptions that the targeted student cohort would be comprised of SPRDE individuals who had attained sufficient field experience and demonstrated systems engineering excellence that collectively resulted in a high level of readiness for expanded technical leadership roles and responsibilities. In addition, the SYS 350 lens development shared the common development tasks of using the systems engineering technical leadership competency-based curricula architecture, developing module-specific technical and leadership focus areas, allocating lecture, case study, exercise, and group project time for the purposes of schedule development, and developing story boards for research team-DAU red team review. This process allows for continuous feedback amongst course developers and DAU sponsors and is viewed as a repeatable process in preparation for course development. In addition, and perhaps most significant, was the targeted student experience level and organizational expectations of future responsibilities.

**SYS350A Systems lens:** Course development leveraged educational material and products that exhibited, on balance, mature levels of educational readiness at the outset. Further, SYS350A focus areas provided a framework to assign, in many cases, existing systems engineering technical leadership materials being developed for the Stevens' METL graduate program as well as independent works from a variety of industrial and academic subject matter experts. To that end, the challenge presented to the RT-4 team was that of integration and tailoring for technical leadership alignment. Integration of the selected SYS350A course material was conducted in a 'plenary session' fashion with high dependence on the expertise of the 350A course owner to both integrate, instruct and perhaps more significantly, leverage a dynamic life cycle based group project wherein the SPRDE student was required to react to dynamic changes to a set of simulated pre-proposal activities. Referred to as the 'seminar approach', this course development process minimized syllabus discontinuities, optimized course integration through the use of a single lead integrator, and provided a broad array of experiential technical

leadership topics and actions. By nature of the course objectives, 350A served as a natural extension to existing systems engineering academic and professional development programs. Integration of 350A leadership threads that emphasized understanding one's individual behavioral and leadership strengths and weaknesses and demonstrated applications of successful leadership approaches for a variety of collaborative systems engineering efforts initially posed more challenges from the perspective of technical connection and content balance. After refining and testing 350A over the course of three pilots with a broad array of SPRDE experience and expectations, the seminar course development approach proved highly effective for SYS350A.

**SYS350B Business lens:** After considering a variety of development approaches, the selected SYS350B development approach was an objective-based approach, as opposed to the seminar approach of SYS350A. Further, there were two tiers of objectives:

- 1) Tier-1 objectives were threefold which include Understanding how Industry Businesses Operate, Leading and Influencing Teams, and Enhancing Technical Buying Power.
- 2) Tier-2 objectives were comprised of three specific focus areas that served as technical foundational elements; Business Strategy, Financial Acumen, and Technology and Innovation Management.

SYS350B was a first significant SYS 350 exposure to technical topics outside the normal operating modes of SPRDE systems engineers. Further, course development leveraged the portfolio of educational materials more aligned with the industrial or commercial business sector. The subsequent learning strategy was for the student cohort to collaboratively arrive at enhanced technical buying power strategies by leveraging their learned understanding of public and private commercial business strategy, financial, technology operations and team leadership skills exercised during the class. The 'objective' approach, although providing a more visible framework for course development, posed higher degrees of integration challenges over SYS350A due to the non-systems engineering nature of the technical foundational elements. The supposition that a fuller awareness of how commercial businesses operate would result in the student's ability to independently develop enhanced buying power strategies was highly dependent on the experience and view of the selected faculty who were responsible for development and instruction. To that end, although course integration was ongoing during development, there were many instances of integration conducted in real time through verbal connections of presented material by the attendant faculty with DoD and industry technical leadership experience. The cited learning strategy of independent student conclusions and connection with their DoD business organization was also observed to be in conflict with some student pilot expectations of desiring suggested processes or tools for their domain and organizational specific leadership challenges. The objective course development approach for SYS350B proved to be less than optimal for the one student pilot under test due to syllabus integration challenges, the dominant industry themes resident in the prototype course, and the learning strategy assumption of independent student connection.

**SYS350C Enterprise lens:** Course development was a ‘focus area’ approach where seven enterprise focus areas provided the technical foundational elements for the syllabus and were coupled with four leadership focus areas. Whereas SYS350A course content was dominated by technical areas and SYS350B content was a more balanced technical-behavioral syllabus, SYS350C content and class time was dominated by the behavioral topics of understanding the enterprise environment, building enterprise readiness, leading enterprise adaptation, and the use of enterprise change agents. The SYS350C learning strategy was similar to that of 350B using the broader frameworks of organizational and activity based enterprises. The objective approach for SYS350C, as was observed in SYS350B, proved to be less than optimal with this particular SPDRE cohort due to syllabus integration challenges, the dominant industry themes resident in the prototype course, the learning strategy assumption of independent student connection, and as opposed to SYS350A and SYS350B, the insufficient allotted time for the behavioral focus areas.

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### 6.1.2 PILOTS

The SYS350B and SYS350C instructor pilot cohorts exhibited a high degree of commonality with respect to defense acquisition experience. The SYS350B and SYS350C student pilots exhibited broad variances with respect to acquisition experience and perhaps more significantly, course expectations. All four pilots exhibited a common ‘acceptance’ factor wherein the students became more active and accepting of the course as the five-day module proceeded and in all cases the students were actively engaged by the fifth day as evidenced by the passion and quality of the group project presentations.

When comparing student pilot feedback of SYS350B and SYS350C with that of the instructor pilots, there were declines. In some cases, significant declines were noted for both class and instructor evaluations. In addition, the general numerical feedback showed a downward trend as the SYS 350 pilots traversed from SYS350A to SYS350B to SYS350C.

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## 6.2 RECOMMENDATIONS

The following recommendations were developed by the RT-4 team after reviewing the materials and feedback from the SYS350 pilots conducted in Years 2 and 3.

### 1. Student Course Expectations and Cohort Size:

- a. Course content development to include student learning strategy selection, course pre-work assignments, time allocations of lecture, case study, exercise, and project objectives need to be directly aligned with cohort experience, professional experience, and learning expectations. To that end, it is recommended that either a) student selection and expectations be prescribed and agreed to by sponsoring organizations in advance of the course date or b) course content and syllabus be coordinated with sponsoring organizations prior



to student selection. In addition, as SYS 350 is envisioned as a capstone SPRDE course, it is recommended to consider requiring candidate students submit their desired expectations and professional reasons for attendance as part of their selection process to better frame expectations.

- b. Over the course of the RT-4 project, cohort size ranged from as small as thirteen to as large as thirty-two. Based on observations of class participation, group project interaction, and course time management, the recommended student cohort size should range from twenty to twenty-five.
2. **Course Development Approach:** Selection of the optimal course development approach such as the seminar, objective, and focus area approaches exercised during the course of RT-4 is critical for alignment of organizational and student expectation and course lecture, case study, exercise, and group project integration. Due to the capstone nature of the technical leadership course and the emergent nature of the uncertainties, ambiguities, and the critical behavioral elements of influence surrounding the challenges of successful technical leadership, development flexibility to change and acceptance of available teaching materials and new modalities requires similar robustness in the selected course content development approach. The objective and focus areas approaches should be used for first time prototypes to ensure initial alignment with the desired course objectives and to identify strengths, weaknesses, and opportunities through cohort test. The seminar approach, with its inherent robustness to changing course materials, delivery modalities, and guest speaker accommodation should be used for course refinements and sustainment.
3. **Technical-Behavioral Course Content Ratio and Integration:** Technical-behavioral (leadership thread) course time allocations ranged from 18% for SYS350A to approximately 30% for SYS350B and C. Although syllabus time allocation is not necessarily correlated to educational value, it does represent the invested time of the student for learning and sets constraints for lectures, case study, exercises, and group project time. For short duration courses such as the 5-day 350 modules, those constraints can be significant. Further, leadership decisions to achieve desired outcomes rely on individual assessments of disparate data, observation and identifying the most robust path for groups or teams to assess, organize, plan, act, and measure as well as the best ways for a leader to proceed to achieve timely and broad influence. To that end, it can be argued that Technical Leadership education is, on balance, a behavioral educational experience for those with demonstrated technical expertise and high potential for increased organizational responsibilities. A minimum of a 30% Leadership Thread-Technical course content ratio is a recommended starting point for future course development and update.
4. **Group Project: Simulation (SYS350A) vs. Technical Buying Power Strategy Development (SYS350B/C):**



- a. Technical leadership simulations, such as the SYS350A AR2D2 evaluation project, provide high potential for a realistic leadership task or responsibility framework for experiential learning of leadership decisions and experiencing the predicted and unpredicted environmental effects of those decisions. The inherent flexibility, ability to leverage known leadership cases, the exposure to secondary and tertiary consequence, and the potential to capture the experience of technical leaders lend the simulation approach to provide a more tactical perspective of leadership challenge. This simulation can be tailored to emulate the emergent operating environment of technical leadership. The SYS350A simulation was well received in all three SYS350A pilots and is recommended to remain as part of the SYS350A syllabus.
- b. The SYS350B and SYS350C group project approach was that of student groups developing and presenting an “Enhanced Technical Buying Power Strategy”. The analytical and strategic underpinning of this leadership learning approach required groups to assess the meaning of “technical buying power” using the Acquisition, Technology, and Logistics (ATL) memo of 10 September 2010 as an entry point, jointly develop an initiative, and then present, during the last day of class, their initiative to a simulated set of DoD and industry executives. In the case of SYS350B, groups began working on the project on Day 1 and were given presentation requirements that somewhat constrained the form of their presentation to be that of a conventional slide-based presentation. In the case of SYS350C, groups were tasked to engage in modeling their structural or activity-based enterprise of interest and characterize the behaviors of their enterprise using a set of specific questions and tasked to communicate their enterprise-based technical buying power initiative on Day 5 in a format of their choosing. In all the SYS350B/C pilot cases, student groups were oft times comprised of students from different organizations that required the group to jointly develop a process for identifying a single enterprise of interest and initiative. This, in some groups, presented issues initially but was overcome in the final analysis. In addition, the “technical buying power” approach for both 350B and 350C is viewed as somewhat of a repeat process notwithstanding the differing natures of a ‘business’ versus ‘enterprise’ and the free-form presentation approach of the SYS350C group project.
- c. Both the simulation and technical buying power initiatives have strengths and weaknesses when assessed for optimal leadership learning strategy. Cohort experience and homogeneity, the degree to which it is desired that students or groups independently assess and develop strategy versus making tactical decisions, and the availability of credible case-based simulations all need consideration in future SYS 350 implementations. However, due to the inherently emergent nature of technical assessment and leadership decision, it is recommended that simulations be the preferred approach for all three SYS 350 modules.

5. **350A Readiness:** Although the size and breadth of the student cohorts presented instructor challenges with respect to aligned course objectives with student expectation and delivering the desired material in the allotted 32 hours of class time, SYS350A, with minor changes to its current form, is recommended for transition to the DAU portfolio of systems engineering courses.
6. **SYS350B Readiness:** Although the impact of student pilot cohort homogeneity, expectations, and consistent professional development needs appeared to influence the disparity between favorable instructor and less than favorable student pilot evaluations of SYS350B, SYS350B in its current state is not recommended for transition to DAU. Further, even as the objective course development approach for SYS350B proved to be less than optimal for the one student pilot under test due to syllabus integration challenges, the dominant industry themes resident in the prototype course, and the learning strategy assumption of independent student connection, the readiness issue appears to be more dependent on course content selection versus the objective approach. To that end, it is recommended that the following three SYS350B redesign approaches be considered.
  - a. Refinement: Retain the current technical focus areas and order of instruction; Retain the three leadership threads of Influencing without Authority, Communications and Coaching, and Leading Teams and Groups; expand aerospace and defense content in all lectures and exercises; replace current case studies with two aerospace and defense cases of 1) a successful business growth strategy and 2) a successful technical competency improvement or change, technology; and assign a specific buying power initiative to each student group in order to invoke broader aerospace and defense business considerations.
  - b. Focus Area Modification: Modify the current three technical focus areas and order of instruction to Business Planning (Strategy, Organization, Marketing, Competitive Proposals), Business Operations (Engineering, Technology, and Innovation), SPRDE Better Buying Power; retain the three leadership threads of Influencing without Authority, Communications and Coaching, and Leading Teams and Groups; replace current case studies with two aerospace and defense cases of 1) a successful business growth strategy and 2) a successful technical competency improvement or change, technology; and consider augmenting or replacing the current 'better buying power' group project with a technical leadership simulation focused on improving or changing a business core offering or technical competency.
  - c. Focus Area Change: Change the focus areas to span three representative aerospace and defense companies such as 1) a Tier-1 Prime Integrator, 2) a Tier-2 System Developer, and 3) a component or technology supplier; dedicate one day of instruction for each selected business and discuss Business Planning, Business Operations, Better Buying Power approaches highlighting how buying power initiatives may differ amongst the three representative companies; assess

the use of a technical leadership simulation exercise to replace the group project; and retest the iterative SYS350B course using a more homogeneous (experience and expectations) student cohort before considering transition to a DAU course offering.

**7. SYS350C Readiness:** As was the case for SYS350B, the impact of student pilot cohort homogeneity, expectations, and consistent professional development needs appeared to influence the disparity between favorable instructor and less than favorable student pilot evaluations of SYS350C. SYS350C in its current state is not recommended for transition to DAU. Further, even as the objective course development approach for 350C proved to be less than optimal for the one student pilot under test due to large number of focus areas, the disparate definitions and expectations of the nature of an Enterprise, syllabus integration challenges, the commercial industry themes resident in the prototype course, and the learning strategy assumption of independent student connection, the SYS350C readiness issue appears to be more dependent on clear definitions of the Enterprise of interest and course content selection versus the objective approach. To that end, it is recommended that the following four SYS350C redesign approaches be considered.

- a. Refinement: Retain the seven current pilot focus areas noted in Figure 4 above; reduce the number and durations of lecture and exercise segments; reduce number of pre-course readings and case studies; replace the current case studies with aerospace and defense cases that illustrate large Enterprise engineering or technology strategy, policy, and adaptation initiatives; assess the use of a case-based simulation of an Enterprise technical leadership challenge potentially sourced by a panel of current USG or industry executives; and reduce number of in-class leadership thread exercises. In addition, ensure that there are no repeats of any 350B course material or exercises.
- b. Focus Area Reduction: Reduce the number of technical and leadership focus areas to the four areas noted in the Figure 6 below; reduce the number and durations of segments; reduce number of pre-course readings and case studies; replace the current case studies with aerospace and defense cases that illustrate large Enterprise engineering or technology strategy policy, and adaptation initiatives; assess the use of a case-based simulation of an Enterprise technical leadership challenge potentially sourced by a panel of current USG or industry executives; and reduce number of in-class leadership thread exercises. In addition, ensure that there are no repeats of any 350B course material or exercises.

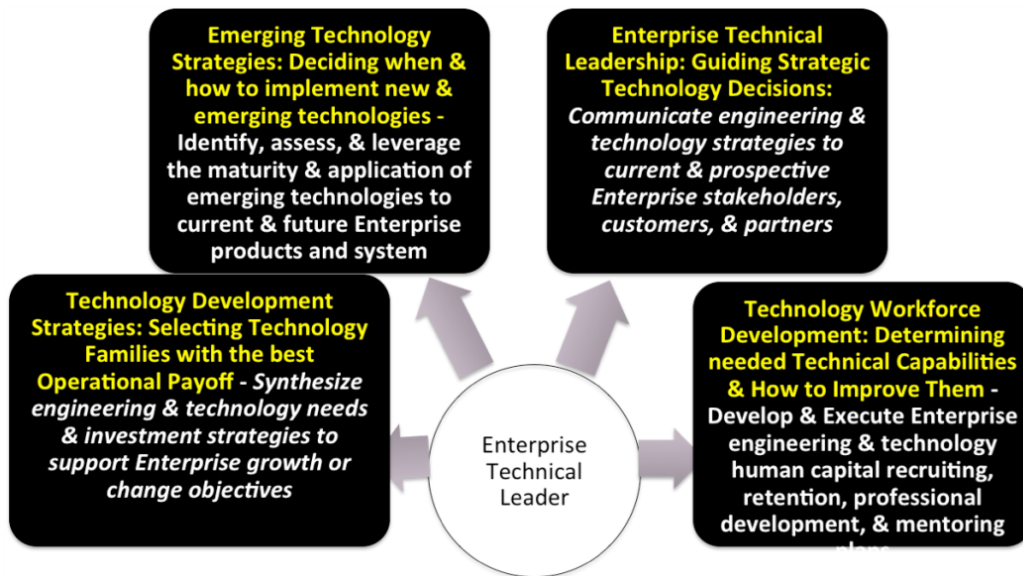


Figure 6. SYS350C Enterprise Focus Areas & Technical Leader Responsibilities

- c. Seminar: Reduce the number of technical and leadership focus areas to the four areas noted in Figure 6 above; Define lecture and case study topics which reflect the four focus areas and then solicit lecture/case study input from Enterprise executives & Academic faculty. Replace 'Enterprise Questions' with a simulation an Enterprise technical leadership challenge potentially sourced by a panel of current USG or industry executives for the group exercise.
- d. Case Study: Reduce the number of technical and leadership focus areas to the four areas noted in Figure 6 above; select three representative case studies of Enterprise engineering or technology strategy policy, and adaptation initiatives that guide daily (Day 2 – 4) discussion and exercise; Replace 'Enterprise Questions' with individual Technical Leadership White Paper submissions by each student that focuses on a Technical Leadership topic or issue of their choice or an Enterprise Leadership Simulation potentially sourced by a panel of current USG or industry executives; conclude on Day 5 with an invited guest speaker from government or industry.

## APPENDICES

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## APPENDIX A. REFERENCES

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## **APPENDIX B. YEAR 3 MILESTONES**

### **March 2012**

- Develop materials for SYS350B red team (in progress)
- Red Team Date (one day between 3/13-3/16 submitted, awaiting feedback)

### **April 2012**

- Develop materials for SYS350B red team (complete)
- April 13 – SYS350B Red Team at DAU (complete)
- April 16-20 – SYS350A Pilot 3 at Redstone Arsenal (complete)

### **May 2012**

- May 14-18 - SYS350B instructor pilot at DAU (complete)
- SYS350B instructor pilot at Ft. Belvoir (complete)
- May 21-25 – Update of SYS350B materials based on instructor feedback (complete)

### **June 2012**

- June 4-8 – suggested dates for SYS350b student pilot (awaiting feedback)

### **July 2012**

- Analysis of feedback from 350B pilots and update of 350B materials
- Preparation for 350C red team
- Delivery of interim report, including initial analysis from SYS350B

### **August 2012**

- 350C Storyboard Development
- 350C Project Development
- Delivery of interim report, including analysis from SYS350B

### **September 2012**

- September 5 – 350C red team
- 350C material development
- Logistical preparations for instructor pilot

### **October 2012**

- October 1 – 5, 2012: SYS350C instructor pilot
- Analysis of feedback from SYS350C instructor pilot
- Revision of 350C materials based on instructor pilot feedback
- Logistical preparations for SYS350C student pilot

### **November 2012**

- November 5 – 9, 2012: SYS350C student pilot
- Analysis of results from 350C pilots and update of 350C materials
- Preparation of final report

#### **December 2012**

- Identification of possible improvements for SYS350C (complete)
- Determination of way ahead on SYS350C (in progress)
- Drafting of RT-4 final report (in progress)
- Identification of all copyright concerns in RT-4 materials (in progress)

#### **January 2013**

- Socialization of Year 3 final report with DAU (to be completed)
- Socialization of IP material inventory with DAU (to be completed)
- Continue developing proposal for future work on SYS350 (in progress)

#### **February 2013**

- Final report on year 3
- Delivery of all SYS350 materials
- End Year 3



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## APPENDIX C: INTELLECTUAL PROPERTY/COPYRIGHT MATERIALS

There is a total of 883 items, including the latest readings. All the cross references have been updated (e.g. if a video screen shot is embedded in a slide, the corresponding notes column was added as: see Videos, Item #,) A similar process was used for readings.

There are 2 color codes:

**Red:** The source cannot be found. There are only 4 items in this category, which represents less than 0.5% of the total.

**Blue:** Permission required as the source has been identified, while still waiting on permissions.

A new version of the slide decks that need to have replacement images will be created, problematic content will be removed and replaced with placeholders.

The following slides require placeholders:

### **SYS350A**

Module 10 - slides 18 and 28

Module 16 - slide 29, image #4

### **SYS350B**

Module 8 - slides 14-21

### **SYS350C**

Verbal permission for transfer to DAU and DAU use received 2/28/13 for Module 12 - slides 6-8 and 14-20. Written confirmation will be forwarded to DAU when received

A final review of the contents of the DVDs will be completed and included in the deliverables.

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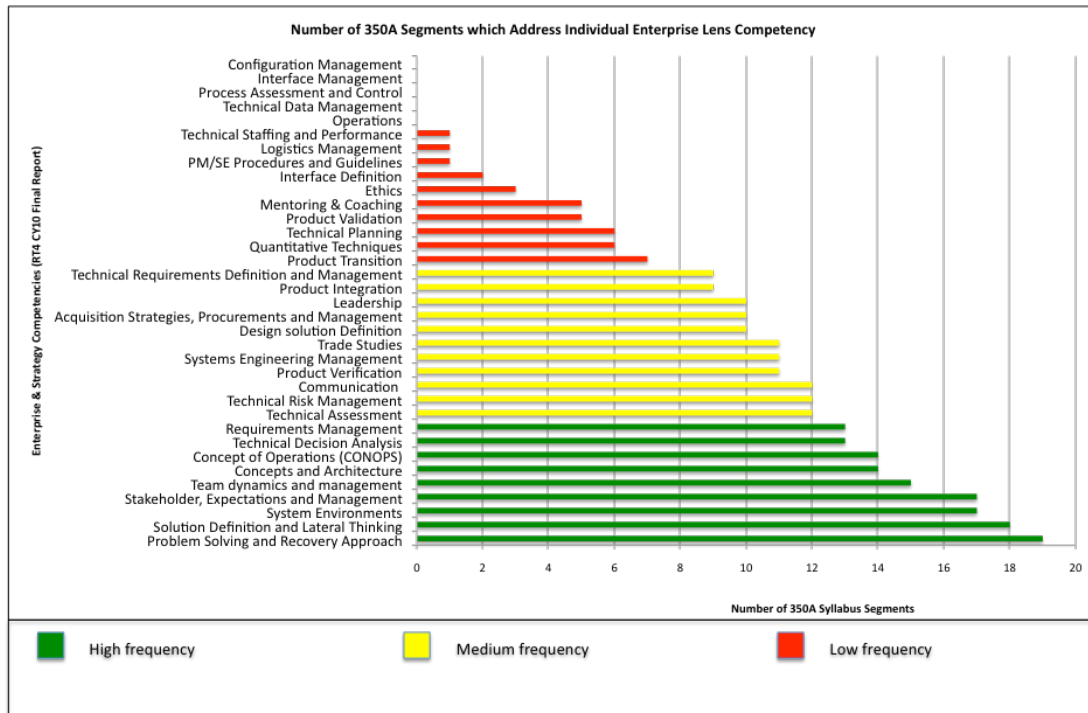
## APPENDIX D: ALIGNMENT OF COURSE CONTENT/COMPETENCIES

SYS 350 pilot course content development leveraged a competency based curriculum architecture of Systems, Business, and Enterprise. It developed focus areas and objectives to guide, as opposed to direct, content development. Although directed content development requirements such as identifying specific competencies, as guidelines for content development were not imposed on content developers, the competencies served as a framework for review of the course content under development. In addition, as the selected learning strategy was for individual students to become exposed to experiential based examples of leadership, an intent of the pilot SYS350A, B, and C modules was to provide students with an opportunity to begin developing their individual leadership competencies based on their self awareness and domains of application. The objectives for each of the lenses (SYS350A-C) are meant to provide students with an opportunity to begin developing competencies.

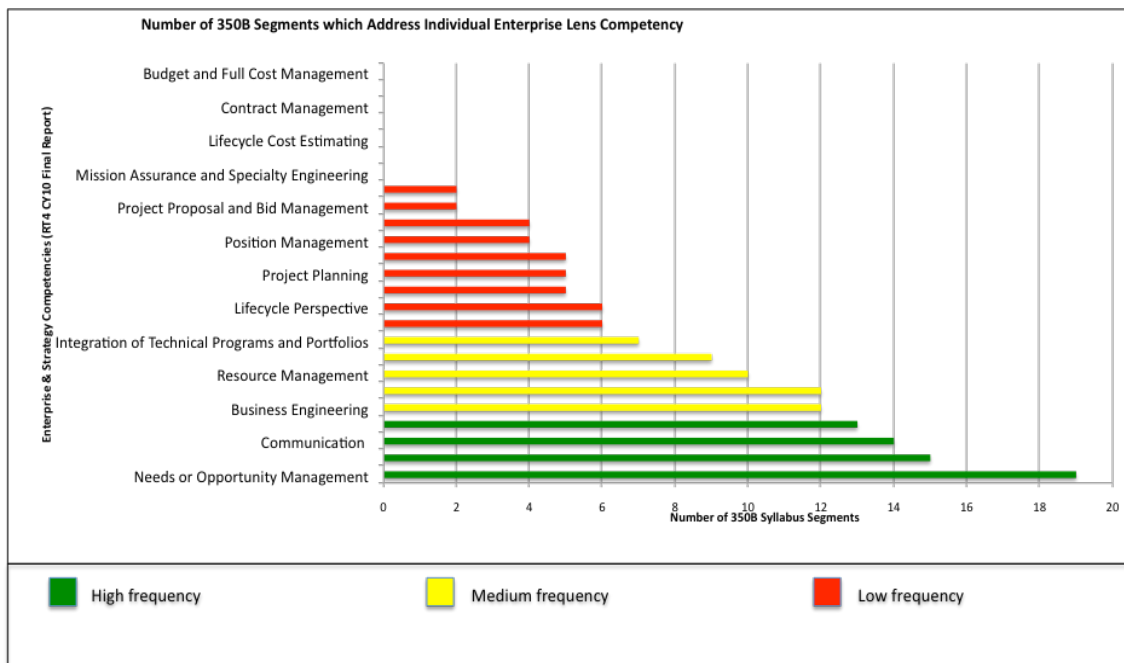
This appendix shows a subjective alignment analysis conducted by the RT-4 team. The purpose of this exercise was to provide a preliminary assessment of the frequency at which the competencies were covered in each course. The most frequent competencies that were covered are highlighted in “green columns”, the medium coverage is highlighted in “yellow columns” and the low coverage is in “red columns”.

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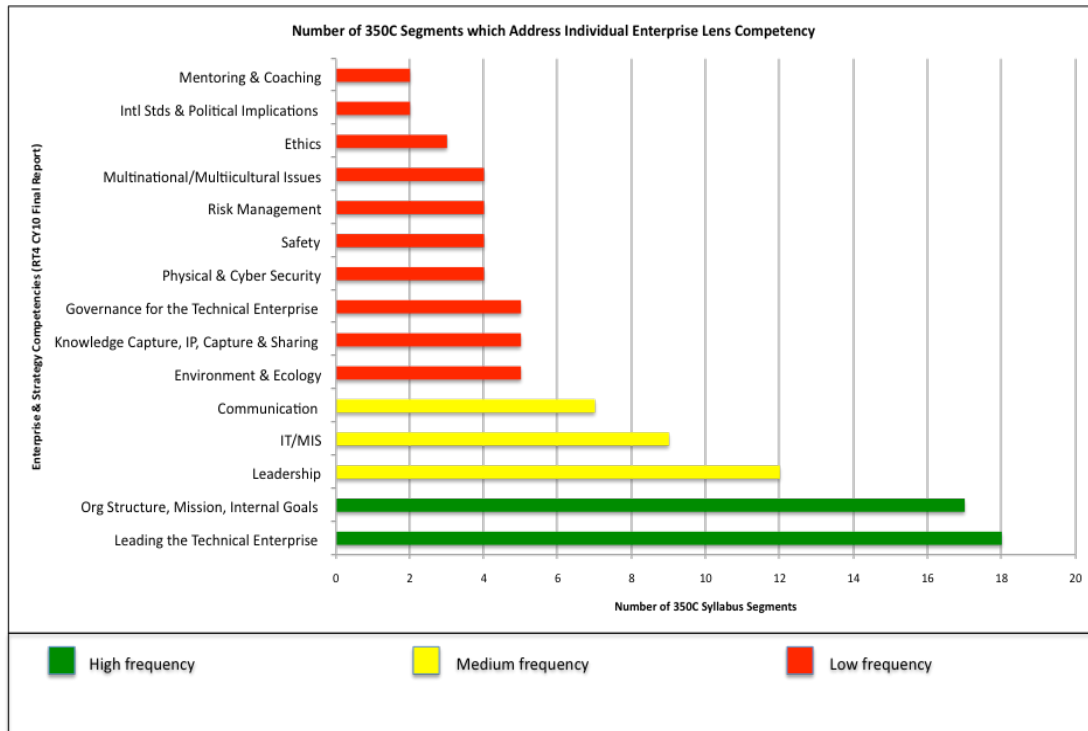
## D.1 SYS350A: SYSTEMS LENS



## D.2 SYS350B: BUSINESS LENS



## D.3 SYS350C: ENTERPRISE LENS



## APPENDIX E. DETAILED FEEDBACK DATA, ANALYSIS, AND CONCLUSIONS

The following course descriptions were developed for DAU SYS 350 courses and were delivered to DAU in May 2011.

### E.1 PILOT CLASS SIZE

All three SYS350A/B/C instructor and students pilots' class sizes are illustrated in the following table:

Table 2. Instructor and Student Pilot Sizes for All Lenses

	Instructor Pilots	Students Pilots	Total
<b>SYS350A</b>	7	30	37
<b>SYS350B</b>	8	11	19
<b>SYS350C</b>	13	28	41
<b>Total</b>	28	69	97

### E.2 INSTRUCTOR AND COURSE EVALUATION

#### Overall Instructor Evaluation

The data from instructor and student course evaluations is represented in Figure 1 where it is shown that:

- For both SYS350 A and B, 100% of the students and DAU instructors have responded consistently that they either agreed or strongly agreed that the instructor was an effective teacher. Whereas 80% of the students who attended 350 C have agreed or strongly agreed that the instructor was effective.

The following comments related to the instructor were made by more than 80% of the students who took the survey:

- Excellent knowledge, skills, and practical insight of the instructors
- Diversified experience of instructors including a mix of technical and psychological experience
- Ability of the instructor to relate course subject to real business examples
- In general the instructors were very good, and Stevens was well prepared in engaging knowledgeable professors

## Course Evaluation

### A. Overall Course Evaluation

- More than 90% of the students and instructors have responded consistently that they either agreed or strongly agreed that SYS350 A and B were excellent. Up to 90% of the instructors liked SYS350C whereas 58% of the students agreed or strongly agreed that the overall course was excellent.

The following comments related to what the students liked best about SYS350A, B and C course were made by more than 80% of the students and instructors who took the survey:

- The case studies and conversations with the other systems engineers during the class were found to be highly valuable.
- Ample time was spent for the class comments and discussions, which added to the material emphasizing leadership in engineering projects.
- The technical component of systems engineering was integrated with the behavioral/soft-skills topics, which made the class very interesting by not staying on one topic for long periods of time.
- Class discussions and related facilitators were rated to be excellent.
- Including experiences of other successful and accomplished leaders was valuable as it allowed students to benefit from various business cultures that they do not normally receive.
- The variety and linkage among various covered subjects (e.g. finance, business, emerging technologies) provided coaching in introspective activities.
- Exposure to the way industry approaches the subjects taught was highly valuable.
- Storytelling (new and interesting) and final activity were highly relevant.

### B. Course usefulness to the organization

DAU instructors (over 70%) responded consistently that they either agreed or strongly agreed that SYS350 A, B, and C material was useful to their organization. However, while 90% of the students agreed that SYS350A was useful to their organization, between 50% and 60% agreed on the usefulness of SYS350 B and C. Some of the most common comments that students made about the course usefulness include:

- Relevant to the organization

- Real life examples were used
- Projects were included that turned into real workshops on the DAU enterprise such as Danaher Corp discussions.
- Relevance of the material.
- Knowledge of industry was intertwined into the course

### **C. Course application to their job**

- More than 90% of the instructors and students have responded consistently that they either agreed or strongly agreed that SYS350A and B were applicable to their job. The instructors agreed (90%) that SYS350C was useful but only 60% of the students consented.

Some of the most common comments that students made about the course applicability to their job include:

- Case studies applicable to the job
- Very relevant to the job and to their professional experiences
- Practicality for on-the-job application of the course material

### **D. Course enabling future career objectives**

An average of 90% of the students and instructors have responded consistently that they either agreed or strongly agreed that SYS350 A and B enabled them to enhance their career objectives. About 80% of the instructors agreed that SYS350C enabled career objectives whereas 60% of the students consented.

Suggested improvements to the SYS350A, B, and C series

The most common students' suggestions for improving the courses are as follows:

- Reduce the content to allow more interaction/discussion
- Receive read-ahead packages earlier
- Keep emphasis on DoD applications for each topic area discussion
- Leave plenty of time for some of the case studies (Danaher), as they provide rich "data" for learning.
- Develop a strategy with the organization that would allow the student-employee to apply relevant course material in their job right away

- Reduce some of the general contents to allow time for more specific content relevant to the organization



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## APPENDIX F: SYS350B AND SYS350C – STORYBOARDS

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### F.1 SYS350B STORYBOARDS

#### RT-4: Technical Leadership Development Program SYS350B (Business Lens) Story Boards

##### Syllabus Segments

0. [Pre-work: Explanation of Pre-Work Set](#)

##### Day 1

1. [Welcome & Course Overview](#) (0:40)
2. [SYS350B Overview & Student Expectations](#) (0:20)
3. [Expanding Systems Technical Leadership to the Business Lens](#) (0:30)
4. [Thread Intervention: Leading versus Managing](#) (1:00)
5. [Thread Intervention: Using Your Multisource Feedback](#) (1:15) – discussion point
6. [Project: Enhancing Buying Power](#) – Intro (1:00)

Homework: Rooster Clagett, Intel 1967-2002 and 2005

##### Day 2 - Strategy

7. [Case Discussion: Rooster Clagett](#) (0:30)
8. [Lecture: The Concept of Competitive Strategy, Value Creation, Mission & Vision](#) (1:15)
9. [Lecture: Industry Structure and Dynamics](#) (1:15)
10. [Lecture: Macro Environmental Analysis](#) (1:00)
11. [Case Discussion: Intel 1967-2002 and 2005](#) (0:30)
12. [Thread Intervention: Influencing without Authority](#) (2:00)
13. [Project: Enhancing Buying Power](#) – In Class Work Time (0:30)

Homework: Du Pont Kevlar and HTC Corporation in 2009

##### Day 3 –Technology and Innovation

14. [Lecture: Technology and Innovation Management](#) (1:00)
15. [Lecture: Aligning a Technology Strategy to the Business Strategy](#) (0:30)
16. [Lecture: Strategic Technology Roadmaps and the S-Curve](#) (0:30)
17. [Lecture: Identifying, Monitoring, and Managing Emerging Technologies](#) (1:30)
18. [Case Discussion: Du Pont Kevlar and HTC Corporation](#) (1:00)
19. [Thread Intervention: Principles of Supportive Communication](#) (1:00)
20. [Guest Lecture](#) [Student Section June 7<sup>th</sup> Only] (1:00)
21. [Project: Enhancing Buying Power](#) – In Class Work Time (0:30)

Homework: Baidu.com - Valuation at IPO

**Day 4 – Financial Acumen**

- 22. [Lecture: Measuring and Analyzing Business and Investment Performance](#) (1:15)
- 23. [Lecture: Risk, Return, and the Time Value of Money](#) (1:00)
- 24. [Lecture: What Can You Learn about Your Current and Potential Contractors from Their Financial Statements?](#) (1:15)
- 25. [Case Discussion: Baidu.com - Valuation at IPO](#) (1:15)
- 26. [Thread Intervention: Leading Teams and Groups](#) (2:00 - 3:00)
- 27. [Project: Enhancing Buying Power](#) – In Class Work Time (0:30)

**Homework: Something related to group project?**

*Day 5*

- 28. [Group Project: Presentations](#) (2:00)
- 29. [Administrative-2: Feedback and Close](#) (0:30)

### Syllabus Segment 0: Pre-Reading Set

Pre-readings will be assigned to each student. Students will be required both to read the materials and provide a brief written response prior to the course. The readings align with the three focus areas for the course (strategy, emerging technology, and financial acumen). Students will be asked to draw upon these readings during the course.

#### Readings

Strategy: Porter, M., "Forces that Shape Competitive Strategy" – This is a fairly standard text on competitive strategy, which includes discussion of industry structure.

Strategy: Collis & Runstad, "Can You Say What Your Strategy Is?" – This article focuses on helping management-level individuals learn how to create concise statements of strategy. This is a critical aspect to ensuring that people within an organization, project, or program both understand and buy into the strategy.

Emerging Technology: Evans, Ralston and Broderick, "Strategic Thinking About Disruptive Technology" – Discusses the differences between disruptive and incremental technology. It discusses the advantage to teams to examine roadmaps, analyze scenarios, etc.

Financial Acumen: *Valuation: Measuring and Managing the Value of Companies* (5<sup>th</sup> Edition), Chapter 2, "Fundamental Principles of Value Creation" – This reading will provide students with basic finance concepts and tools used in valuing firm performance and strategic alternatives.

#### Assignment

For each reading in the pre-work packet, instructors will assign an associated question. Students will be asked to provide a one-page response to each question and submit this to the instructor team prior to the course beginning. [As questions are developed, they should be added here.]

#### Objectives

The primary objective of the pre-work is to introduce students to foundation concepts that will be the basis for in-class work.

The secondary objective of the pre-work is to get the students to begin using analytical skills to examine these concepts (via the assignment).

The tertiary objective of the pre-work is to give the instructor group a benchmark as to the current understanding and abilities of the students with regard to the course objectives.

N.B.: Ideally, students will be given 2-3 weeks to complete the pre-reading and assignments and the instructor team will have a week to review this information. This, however, is dependent upon the students being identified and accepted well in advance of the course start date. For the instructor pilot, the instructors will likely be asked short questions (different from the student questions) which will ask opinions on how well the materials relate to the course goals/objectives. (I.E. – can you see how this reading is relevant given the course objectives?)

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In addition to this, students will be asked to create a student profile and to participate in a multi-source feedback exercise.

## **Syllabus Segment 1: Welcome and Course Overview**

**Time:** 0.6 hour

**Responsible:** Val Gavito

**Support:** TBD

**Speaker:** Val Gavito

**Materials:** Slides

**Readings:** SYS350B Course Description

**Assignment:**

### **Summary**

Faculty and new students will introduce themselves to the class with a short description of their professional background and experience, current roles and responsibilities, and their individual 350B course expectations. In addition, students who have completed SYS350A will provide feedback on any applications of the 350A learning as well suggested 350A enhancements as a result of their post-350A experience.

### **Objectives**

- Break the ice for new students.
- Conduct active feedback on the leadership learning applications of 350A graduates.
- Expand faculty and student awareness of collective experience and individual communication styles.
- Set a positive tone for open faculty-student and student-student 350B interactions.

## **Syllabus Segment 2: SYS350B Overview & Student Expectations**

Time: 0.3 hour

Responsible: Val Gavito

Support: TBD

Speaker: Val Gavito

Materials: Slides

Readings:

Assignments:

### **Summary**

This segment will provide an abridged overview of the SYS 350 architecture and a more detailed discussion of the SYS350B syllabus lectures, case studies, group effectiveness segments, and the two dominant themes of 350B; Understanding how sellers conduct business operations with emphasis on Competitive Strategy, leveraging Technology, and the definitions and applications of selected Financial Tools as forms of measurement, reporting, and analysis.

### **Objectives**

- Illustrate how 350B expands the technical leadership aperture from building systems and products to that of leading a broader business or organization within which there are several systems, product, and/or service offerings.
- Provide the logic underpinning the selection of the three 350B focus areas and the desired learning objectives of each area.
- Present the 350B syllabus with emphasis on student interaction and the underlying project as the dominant learning processes for conducting the class.
- Gain student feedback on the 350B syllabus with respect to desired emphasis of selected segments, any syllabus gaps for which there are desired discussions, and any questions on 350 process or student expectations.

### **Syllabus Segment 3: Expanding Systems Technical Leadership to the Business Lens: Enhancing Buying Power**

Time: 0.5 hour

Responsible: Val Gavito

Support: TBD

Speaker: Val Gavito

Materials: Slides

Readings:

Assignments:

#### **Summary**

This segment will provide for an interactive, introductory discussion of the DoD Buying Power initiative to include definitions, acquisition policy and process mandates, and implementation strategies from the perspective of Technical Leadership. Particular discussion emphasis includes what initiatives might reside within the span of control of a Technical Leader, how a Technical Leader might manifest the objectives of those initiatives within their operational domain to include their industrial partners, what additional initiatives might provide significant value-add to the objective of enhancing the buying power of technical leaders, and how one might measure progress or impact of the cited initiative on enhancing buying power.

#### **Objectives**

- Stimulate technical leadership thinking with regard to implementing policy initiatives within the operational domains of acquisition.
- Conduct interactive discussions on the impact of the Buying Power Initiatives on the competitive strategies and technology development processes of the defense industrial base.

## **Syllabus Segment 4: Leading versus Managing: Transformational and Transactional Dimensions of Effective Leadership (Thread Intervention)**

Time: 1.0 hour

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, Sutton, R.I. (2010). True leaders are also managers. *HBR Blog Network*, August.

### **Summary**

This introduction session will build upon the general definition of leadership introduced during the Systems lens, which stressed that leadership was the act of influencing. This session we will focus on specific ways of describing leadership behavior, actions and outcomes in terms of what it means to be transformational and transactional. Transactional leadership focuses on an exchange process by which the leader motivates the follower to comply with his or her requests and rules. It is a necessary but typically but not sufficient to drive high performance. Transformational leadership on the other hand motivates followers to perform beyond their expectations by making them aware of important task outcomes, inducing them to do more for the collective than themselves, and activating their higher-order needs.

### **Objectives**

- Understand what it means to distinguish between the notions of leading and managing and how the two roles are in practice inter-related, when it comes to technical and business decisions
- Use distinctions between transformational and transactional leadership to examine specific aspects of leading and managing.
- Provide participants with an opportunity to describe and discuss what they most value about effective leadership



## **Syllabus Segment 5: Using Your Multisource Feedback (Thread Intervention)**

Time: 1.25 hours

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, Multisource Feedback – Feedback summary and development planning workbooks (Stevens)

### **Summary**

Participants will be asked to participate in a multi-source feedback exercise prior to the course.\* This session will focus on helping participants review and interpret their multisource feedback reports. The session will include a brief review of self-awareness themes (e.g. the Johari window concept) but will focus most on providing people with tools to summarize their feedback and to establish some initial plans for what aspects of that feedback they want focus on most in order to develop their technical leadership ability. (see the attached resource workbook)

### **Objectives**

The primary objective of this segment is to give students baseline information to support self-awareness. This will provide a foundation for the non-technical learning modules throughout the course.

\*This is dependent upon the students being identified in sufficient time to conduct the exercise. Three weeks of lead time (minimum) is required to incorporate this. Ideally, participants should also need to have access to computers during the session

## **Syllabus Segment 6: Rooster Clagett (Case Discussion)**

Time: 0.5 hours

Responsible: Bill Guth

Support: Val Gavito and Ralph Giffin

Speaker: Bill Guth

Materials: Slides, Case Study “John ‘Rooster’ Clagett: Visual Training Solutions Group, Inc.” (UVA Darden Business Publishing pdf)

### **Summary**

This case will introduce the students to the needs for competitive strategy decision making in business organizations. The case description of the situation facing Rooster Clagett and his young company Virtual Systems Training Group clearly indicates that Rooster has several majorly different alternative ways to grow his company in the future. Each alternative path to future growth for the company targets different markets, including procurement for the Department of Defense. In evaluating each of these alternatives, Rooster must consider who his competitors will be, and the resources he and his company have compared with what will be needed to make it possible to be successful in competing with them. He must determine the amount of value his company can create in each of these alternative paths compared with that created by his potential competitors. The case also makes it clear that Rooster has to consider how congruent each alternative path is with his own personal values and goals.

### **Objectives**

- To introduce the participants to the need for competitive strategy analysis and formulation in business organizations
- To establish the management need for and potential usefulness of concepts, knowledge and tools helpful in analyzing competitive strategy issues and in formulating competitive strategies with high prospects for success in creating value
- To introduce the role of personal values and goals in business leadership

### Syllabus Segment 7: Enhancing Your Buying Power - Introduction (Project)

Time: 1.0 hour

Responsible: Ralph Giffin

Support: Val Gavito

Speaker: TBD

Materials: Slides

Readings: TBD

Assignment: Students will create a presentation to address the project.

#### Summary

Students will be asked to synthesize and reflect on what they have learned in 350B and demonstrate how this learning experience and newly gained knowledge might impact their ability to perform in their current positions. They will be asked to do this via a group exercise which will take place across the week with time at the end of each day devoted to reflect on the day's topics and identify ways in which what they have learned can be translated into outcomes which will enhance their technical buying power as government acquisition professionals. Finally, they will be asked to package and deliver their findings to at least two different constituent types (receivers) demonstrating their understanding and use of various supportive communication and influence principles introduced in this course.

#### Objectives

- Identify how 350B learning outcomes can be translated into enhanced on-the-job performance
- Demonstrate the ability to create clear and concise messaging and the ability to utilize various supportive communication and influence principles via a presentation to different constituent types (receivers)
- Demonstrate the ability to create a credible and impactful plan which gains buy-in from stakeholders

Supportive Communication Principles by Receiver type	Communicating to Peer	Communicating to Customer	Communicating to Team	Communicating to Senior Exec
Influence Tactics				
Interpersonal Style				
Attention Span				

Table 1 – Communication Intersections

## **Syllabus Segment 8: The Concept of Competitive Strategy, Value Creation, Mission & Vision (Lecture)**

Time: 1.25 hour

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides

### **Summary**

In competitive industries, firms must have one or more competitive advantages to enjoy above average financial returns. The objective of competitive strategy is to create competitive advantage(s). The more sustainable these advantages are, the greater their value to a firm over longer periods of time.

Current and potential competitors, however, are powerfully motivated to overcome the high performing firm's competitive advantage(s), thus capturing increased financial performance for themselves. This motivation encourages innovation in all of the activities of firms that create value, e.g., product conception and design, communication with customers, inbound logistics, production processes, outbound logistics, and distribution channels. Innovation by competitors is a major driver of the need for the managers of even very high performing firms to constantly monitor the effectiveness of their current competitive strategies, and to periodically modify, reorient, or restructure them. Macro changes in the political, social, economic and technological environment of industries and the firms in them also create new opportunities and challenges to firms, requiring constant monitoring, and periodic changing of their competitive strategies.

Competitive advantage is the result of creating a larger spread between the value to the customers of what is being sold and the cost of producing as compared with that of their competitors.

Vision and mission are business leadership tools useful in communicating internally and externally to the various stakeholders of the firm the level of performance being targeted by management, and the choices management has made about where the firm will attempt to create value and competitive advantage. Competitive strategy defines how the firm will create value and competitive advantage in that arena.

### **Objectives**

- To develop the analytics of value creation
- To present the principles underlying the concept of competitive strategy
- To clarify the meaning of terms widely used in business practice in relation to firm performance

- To explore the value of understanding competitive strategy in relating to firms as buyers of their products and/or services.
- To explore the value of the concept of value creation in application to increasing buying power.

## **Syllabus Segment 9: Industry Structure and Dynamics, Industry Segmentation, and Competitor Benchmarking (Lecture)**

Time: 1.25 hours

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides

### **Summary**

There are three major determinants of firm performance:

- 1 The firm's macro environment (economy, technology, society, regulation, etc.)
- 2 The firm's immediate industry environment (competition, rivalry, buyers, suppliers, etc.)
- 3 The firm's resources, capabilities, and the actions of its decision makers.

Some analysts lump the factors in the last two of these determinants of firm performance into a general category called micro-economic variables. Several empirical studies have documented that these micro-economic variables account for as much as 80% of the variance in firm performance.

This session will develop concepts and tools useful in analyzing the impact of a firm's industry on the effectiveness of its competitive strategy, and concepts and tools useful in analyzing the types of resources a firm brings to its competitive strategy and their potential to sustain competitive advantage.

### **Objectives**

- To help participants understand the pressures current and potential contractors are under from their industry structures and dynamics.
- To provide participants with tools useful in understanding and predicting the financial performance of current and potential contractors.
- To encourage participants to consider the impact of their acquisition programs on the structure and dynamics of the defense industry in search of ways to increase their buying power.

## **Syllabus Segment 10: Macro Environmental Analysis (Lecture)**

Time: 1.00 hours

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides

### **Summary**

A firm's macro-environment consists of factors in its surroundings that have the potential to affect its performance. The impact of macro-environmental factors is often general and indirect, requiring careful analysis to link to firm performance.

Macro-environmental factors include sociocultural, technological, political-legal, and economic variables. A firm considers these variables as part of its environmental scanning to better understand the threats and opportunities facing the firm and how strategic plans need to be adjusted, modified, reoriented, or restructured so the firm can obtain or retain competitive advantage.

The segment will develop a framework for macro-environmental analysis, and illustrate its application to a number of different firms' competitive strategies. The session will end with a discussion of the macro-environmental variables impacting the defense industry.

### **Objectives**

- To introduce participants to macro-environmental analysis as a critical tool in the formulation of competitive strategy.
- To illustrate the need for continuous monitoring of the macro-environment and its potential impact on the overall attractiveness of various industries.
- To encourage periodic discussion with colleagues of changes in the macro-environment surrounding defense procurement and the impact of these changes on their strategies for increasing buying power.

## **Syllabus Segment 11: Discussion of Intel Corporation 1967-2002 and 2005 (Case Discussion)**

Time: 0.5 hours

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides, "Intel Corporation: 1968-2003" and "Intel Corporation 2005" (Harvard Business School pdf)

### **Summary**

These cases present the industry structure and dynamics of the microchip/microprocessor industry since the beginning of Intel with its invention of the microchip. Intel's competitive strategy based on its microchip invention was seriously flawed when viewed from the perspective of the industry as a whole, and in 1979 management decided to stop producing them. Having learned from their mistakes in microchips, management developed a competitive strategy in microprocessors that has kept the company at the top of its industry since then. The case compels participants to consider the impact of the Internet on Intel's competitive strategy looking forward.

### **Objectives**

- To develop participant skills in applying industry structure and dynamics analysis to identify the vulnerabilities and strengths of various competitors.
- To highlight the point that competitive strategy is more complex than simply inventing a better product.
- To underscore the point that competitive strategy must consider the sustainability of competitive advantage as well as its initial creation.



## **Syllabus Segment 12: Influencing without Authority: Leaderless Group Discussion (Thread Intervention)**

Time: 2.0 hours

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, "Applying and Resisting Peer Influence" (MIT Sloan Management Review)

### **Summary**

We will use a leaderless group discussion exercise (CTC Corporation) to provide participants with an opportunity learn more about their own approaches to influencing and collaborating with others. Working in small groups of 5-7, participants assume the roles of senior functional managers within a fictitious aerospace and defense corporation. Within those groups they will work toward a consensus decision on who to send to a leadership development program. The exercise is debriefed in terms of who and why people were able to influence the decision process. Key principles of interpersonal influence will be described and applied to what they experienced. The activity will require that each group have one program facilitator serve as an observer.

### **Objectives**

- Understand and apply key principles of interpersonal influence in small group settings.
- Provide participants with real time feedback on their own skills and approaches to influencing others and shaping team decision processes

### Syllabus Segment 13: Enhancing Your Buying Power - Continued (Project)

Time: 0.5 hours

Responsible: Ralph Giffin

Support: Val Gavito

Speaker: TBD

Materials: Slides

Readings: TBD

Assignment: Students will create a presentation to address the project.

#### Summary

Students will be asked to synthesize and reflect on what they have learned in 350B and demonstrate how this learning experience and newly gained knowledge might impact their ability to perform in their current positions. They will be asked to do this via a group exercise which will take place across the week with time at the end of each day devoted to reflect on the day's topics and identify ways in which what they have learned can be translated into outcomes which will enhance their buying power as government acquisition professionals. Finally, they will be asked to package and deliver their findings to at least two different constituent types (receivers) demonstrating their understanding and use of various supportive communication and influence principles introduced in this course.

#### Objectives

- Identify how 350B learning outcomes can be translated into enhanced on-the-job performance
- Demonstrate the ability to create clear and concise messaging and the ability to utilize various supportive communication and influence principles via a presentation to different constituent types (receivers).
- Demonstrate the ability to create a credible and impactful plan which gains buy-in from stakeholders

Supportive Communication Principles by Receiver type	Communicating to Peer	Communicating to Customer	Communicating to Team	Communicating to Senior Exec
Influence Tactics				
Interpersonal Style				
Attention Span				

Table 1 – Communication Intersections

## **Syllabus Segment 14: Technology and Innovation Management (Lecture)**

Time: 1.0 Hour

Responsible: W. Reinisch

Support: Val Gavito

Speaker: W. Reinisch

Materials: Slides

Readings: TBD

### **Summary**

This section provides an introduction to management of technology and innovation. We will present and discuss techniques and business approaches for the technology investment process. We will also discuss the issues that businesses face in planning for technology and innovation.

### **Objectives**

- To develop an awareness of the range, scope, and complexity of the issues and problems related to strategic management of technology and innovation.
- Relate strategic management of technology and innovation to the system engineer.
- To develop an understanding of the “state-of-the-art” of strategic management of technology and innovation.
- Discuss management skills, methodologies and critical thinking in order to achieve a sustainable technological competitive advantage.
- We will review the technological basis of a firm, assessing the firm’s innovation capability, technology life cycles, development strategies, and core competencies. To provide some of the background and skills to develop or assess the technology strategy of an organization.
- We will review the importance of intellectual property in the organization. Discuss alternative intellectual property strategies, how companies view IP and the value it creates, and some of the processes they use.
- To review some of the tools and concepts used by companies that are working in technology intensive industries.
- To offer some practical framework for defining strategic management of technology and innovations.

## **Syllabus Segment 15: Aligning a Technology Strategy to the Business Strategy (Lecture)**

Time: 0.5 Hour

Responsible: W. Reinisch

Support: Val Gavito

Speaker: W. Reinisch

Materials: Slides

Readings: TBD

### **Summary**

How the corporate strategy relates to the technology and innovation strategy. The firm's technology strategy relates directly to the technology competencies and capabilities. The technology strategy is shaped by the internal organization and the external factors.

### **Objectives**

- To review the basic skills necessary to assess or construct a technology strategy for a firm.
- To develop an understanding why a firm's technology strategy, business strategy and the needs of the customer must be aligned.
- Develop an understanding of why achieving technology-based competitive advantage can be part of firm's business strategy.
- Review the Porter Model.

## **Syllabus Segment 16: Strategic Technology Roadmaps and the S-Curve (Lecture)**

Time: 0.5 Hour

Responsible: W. Reinisch

Support: None

Speaker: W. Reinisch

Materials: Slides, Need Map Template

Readings: TBD

### **Summary**

Description of the types and characteristics of technology and innovation projects and how they integrate with the technology assets of the firm. An Introduction to strategic road maps and the different types of business and technology projects. Use of technology road maps as a technology and business communication tool, including customers', technical, and business needs. The S-Curve and why it is a critical tool for understanding a technology-based strategy.

### **Objectives**

- To review needs and types of business and technology-based innovation projects.
- Review Strategic Technology Road maps, Product-Technology Roadmap, and Technology Needs Map Template.
- Review S-Curves.
- To develop an understanding why road maps and S-Curves are important tools for a technology-based firm, and how to use them to assess a technology and/or market.
- Understand how to use these tools to better understand the technology and status of the firm and/or market.

**Syllabus Segment 17: Identifying, Monitoring, and Managing Emerging Technologies (1:30)**

Time: 1.5 Hours

Responsible: W. Reinisch

Support: Val Gavito

Speaker: W. Reinisch

Materials: Slides

Readings: TBD

**Summary**

Effective systems engineering technical leaders have the ability to “see around corners.” They know before others when technology trends are shifting, evolving, being disturbed and/or becoming obsolete. They’re also able to understand and react quickly and successfully to how these technologies can impact their business solutions and affect the supply chain. This segment introduces the “Emerging Technology” Focus area to support systems engineering leaders and promotes their understanding of how the industry professionals utilize a combination of strategies and develop emerging and sustaining enabling technology to support their business strategy and objectives. In addition, this segment will focus on initial understanding of the tools that can be utilized in identifying, monitoring and managing emerging technologies.

**Objectives**

- Discuss and define emerging and disruptive technology – Review the Management Changes of Emerging Technologies and why they are different. Enhance and develop knowledge in the management of emerging technologies. Provide some relationship to how commercial technology can be utilized in existing or future DoD systems and the challenges.
- We will address why the management of emerging technologies is different from more mature technologies, including issues for incumbents, established and Startup companies. Review market opportunities and “technology push” vs. “market pull” relationships in this field.
- We will discuss the management challenges posed by emerging technologies at the point where scientific research reveals a technological possibility and follow this all the way to commercialization of the technology into lead markets.
- We will address how to understand, assess, and evaluate some of the organization challenges facing companies dealing with emerging technologies. This will include discussion of the identification and evolution of emerging technologies. (Optional: If Time available: Discuss perspectives on emerging technologies, future customer trends, and forecasting methodologies including scenario planning/construction and the accuracy of past technology forecasts.)
- This section will attempt to bring an element of rigor to a relatively new and constantly evolving field of management.

- Discuss ways in which to build technology investment roadmaps that align with business growth strategies, provide for continuous assessment of technology maturity, provide comparative assessments of competitor positions, illustrate applicability to market demands, and support optimal investment decision points.
- A short group exercise will be utilized. Teams will develop a list of emerging technologies from the perspective of the student's domain.

### **Syllabus Segment 18: Du Pont Kevlar and HTC Corporation in 2009 (Case Discussion)**

Time: 1.0 Hour

Responsible: W. Reinisch

Support: TBD

Speaker: W. Reinisch and Class

Materials: TBD

Readings: Du Pont Kevlar Aramid Industrial Fiber (Abridged), HBS Case Study Document and HTC Corp. in 2009, HBR Case Study Document

#### **Summary**

We will use the Case Study Method to reinforce and see practical applications of the foundation elements of the emerging technology segments of this course. This will be accomplished through an interactive discussion facilitated by the instructor of the Du Pont and the HTC cases.

#### **Objectives**

- Students will be expected to have read the case documents and prepare before class.
- The facilitator will be asking questions of the class and to participate in the group discussion.
- The students will be expected to quickly analyze and concisely communicate the technology assessments of the case.



## **Syllabus Segment 19: Principles of Supportive Communication (Thread Intervention)**

Time: 1.0 hours

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, Jodi Hollins Role Play; other reading TBD

### **Summary**

This module would focus on key principles of interpersonal communication and coaching others. Participants will be introduced to eight principles of supportive communication, principles of coaching, to develop talent. They will practice applying them within the context of a role-play that requires them to coach and provide feedback to a direct report who while technically very capable lacks struggles to work collaboratively in a team environment. The role-play will afford participants the opportunity to provide and receive feedback about key communication behaviors that impact team process and interpersonal effectiveness.

### **Objectives**

- Understand and apply key principles of supportive communication and coaching.
- Provide participants with real time feedback on their own skills and approaches to using supportive communication and basic coaching skills to understand performance problems and to help others establish plans for improving

Griskevicius, V. Cialdini, R.B, Goldstein, N.J, (2008). Applying and Resisting peer influence, *MIT Sloan Management Review* 49(2). 84-88.

## **ALTERNATIVE OPTION for Segment 18**

### **Personal Style and Interpersonal Communication (Thread Intervention)**

Time: 2.0 hours

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, DISC workbooks.

#### **Summary**

One widely accepted concept for acknowledging the four basic temperaments or communication styles is known as the DISC method. The DISC is easy to understand, learn, remember, and apply. The D stands for the Driving style and is a measure of how people respond to problems and challenges. The I stands for the Influential style and is a measure of how people influence others to their point of view. The S stands for the Steady/Stable style and is a measure of the intensity levels of a person's behavior toward the pace of the environment. The C stands for Compliance and is a measure how people respond to rules and procedures set by others and their need for information.

This session would focus on helping participants understand the role that interpersonal style plays in effective communication and collaboration. Participants would each complete the Personal Profile System Inventory (DISC model) in order to a) learn more about their own interpersonal style b) develop a deeper appreciation for how to communicate and work with others whose styles are different from their own.

#### **Objectives**

- Learn how to describe interpersonal style and communication in terms of four broad categories that comprise the DISC model.
- Help participants' develop a deeper appreciation for their own interpersonal style – their strengths and areas for development.
- Improve participants' capacity communicate with and influence others whose style and approach is different from their own.

## **Syllabus Segment 20: Guest Lecture (Lecture)**

NOTE: For Student Pilot (June 7th, 2012) Only

Time: 1.0 Hour

Responsible: W. Reinisch

Support: W. Reinisch

Speaker: Dr. H. Lee Buchanan, Venture Partner at Paladin Capital Group, and Former Assistant Secretary of the Navy (Research, Development, and Acquisitions)

Materials: TBD

Readings: None

### **Summary**

A special guest lecturer will come and share his views and experiences of both government and commercial technology acquisitions. He will also review some new models that are developing. This talk will cover the following areas:

Government and commercial business models are vastly different. Very often they are completely incompatible. As a result the number of defense contractors doing business commercially and vice versa is very rare. As a result the DoD can be denied many of the most advanced technologies that are readily available in the commercial sector. He will discuss some of the biggest areas of disparity and point to some ways of overcoming the barriers.

### **Objectives**

- To provide real work and outside views of the state of the art practices in the field.
- To provide current and actual examples from both the industry and government sectors.

### **Biography:**

Dr. Lee Buchanan is currently Venture Partner, Paladin Capital Group in Washington, DC. He is also a Director of Tektronix, Lucent-Alcatel Government Solutions, TestMart, Corp., Advantage Federal Corp, and the Robotics Technology Consortium.

Prior to Paladin Dr. Buchanan was Vice President, Advanced Concepts, EDO Corporation, a \$1B producer of Intelligence, Electronic Warfare, sonar, and weapons systems for the U.S. military; Executive Vice President of Perceptis, a holding company for producers of wireless data collection and intelligence systems; and President and CEO of QualStream.

Dr. Buchanan has also had a significant career with the U.S. Government serving as Assistant Secretary of the Navy (Research, Development, and Acquisition), the most senior executive for research, development, and acquisition for the U.S. Navy and the U.S. Marine Corps; Deputy Director and Acting Director of the Defense Advanced Research Projects Agency; Division Manager for Titan Corporation; Senior Research Physicist at the Lawrence Livermore National Laboratory; and Naval Aviator.

He has B.S. and M.S. Degrees in Electrical Engineering from Vanderbilt University and a Ph.D. in Applied Physics from University of California.

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**Report No. SERC-2013-TR-013-4**

**28 February 2013**

## Syllabus Segment 21: Enhancing Your Buying Power - Continued (Project)

Time: 0.5 hours

Responsible: Ralph Giffin

Support: Val Gavito

Speaker: TBD

Materials: Slides

Readings: TBD

Assignment: Students will create a presentation to address the project.

### Summary

Students will be asked to synthesize and reflect on what they have learned in 350B and demonstrate how this learning experience and newly gained knowledge might impact their ability to perform in their current positions. They will be asked to do this via a group exercise which will take place across the week with time at the end of each day devoted to reflect on the day's topics and identify ways in which what they have learned can be translated into outcomes which will enhance their buying power as government acquisition professionals. Finally, they will be asked to package and deliver their findings to at least two different constituent types (receivers) demonstrating their understanding and use of various supportive communication and influence principles introduced in this course.

### Objectives

- Identify how 350B learning outcomes can be translated into enhanced on-the-job performance
- Demonstrate the ability to create clear and concise messaging and the ability to utilize various supportive communication and influence principles via a presentation to different constituent types (receivers)
- Demonstrate the ability to create a credible and impactful plan which gains buy-in from stakeholders

Supportive Communication Principles by Receiver type	Communicating to Peer	Communicating to Customer	Communicating to Team	Communicating to Senior Exec
Influence Tactics				
Interpersonal Style				
Attention Span				

Table 1 – Communication Intersections

## **Syllabus Segment 22: Measuring and Analyzing Business and Investment Performance (Lecture)**

Time: 1.25 hours

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides

### **Summary**

Firms create value by investing capital to generate future cash flows at rates of return that exceed their cost of capital. The faster they can grow and deploy more capital at rates of return that exceed the cost of that capital, the more the value they create. The mix of growth and return on invested capital relative to the cost of capital is what drives the creation of value. Any action that doesn't increase cash flows doesn't create value.

This session will develop these fundamental principles of corporate finance, including the math needed to analyze them. In addition, it will discuss why many widely adopted corporate actions actually destroy rather than create value.

### **Objectives**

- To develop participants' capabilities at analyzing the impact of various firm commitments and actions on the value created by the firm.
- To provide participants with analytic tools useful in understanding a firm's historical financial performance, and in forecasting its financial performance in the future.

### **Syllabus Segment 23: Risk, Return, and the Time Value of Money (Lecture)**

Time: 1.0 hour

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides

#### **Summary**

This session will develop additional concepts and tools useful in evaluating alternative investments managers are considering as part of their competitive strategies. These concepts and tools provide rigorous analysis of the relationships between risk, return, and the timing of cash flows associated with different investment alternatives. The three most widely used valuation methods – discounted cash flow valuation model, economic profit valuation model, and comparable multiple valuation model – will be developed and critically evaluated.

#### **Objectives**

- To develop participants' understanding of the financial implications of the investment decisions of current and prospective contractors.
- To develop participants' capabilities in understanding the financial arguments of current and potential contractors against initiatives proposed by you as the buyer, and to determine which if any of these arguments are BS, or at least are based on flawed analytics.

## **Syllabus Segment 24: What Can You Learn about Your Current and Potential Contractors from Their Financial Statements? (Lecture)**

Time: 1.25 hours

Responsible: Bill Guth

Support:

Speaker: Bill Guth

Materials: Slides

### **Summary**

This session will look at the financial statements of representative firms in the major categories of firms competing in the defense industry, utilizing the concepts and tools developed in the previous two segments. The key questions we will try to answer are: 1) how well is each of the selected firms performing financially? 2) What are the Implications of each firm's financial performance historically, and projected financial performance for your current or potential buying relationship with them?

### **Objectives**

- To develop participants' capabilities at analyzing regularly published financial statements of current and potential contractors, and using those analyses to forecast potential further performance.
- To provide concepts and tools useful in forecasting future financial performance of current and potential contractors, and to analyzing the impact of alternative buying approaches on future performance

## **Syllabus Segment 25: Baidu.com - Valuation at IPO (Case Discussion)**

Time: 1.25 hours

Responsible: Bill Guth

Support: TBD

Speaker: Bill Guth

Materials: Slides, "Baidu.com, Inc.: Valuation at IPO" (Stanford Graduate School of Business pdf)

### **Summary**

Since its launch in January of 2000, Baidu.com Inc. quickly grew to become the leading Internet search provider in China, offering a unique Chinese language search platform and other online community-based products to the Internet users and customers in China. Baidu registered to go public on the NASDAQ in August 2005. The initial public offering (IPO) turned out to be one of the highest-profile debuts since the Internet bubble burst in 2000. The stock price jumped 354 percent on the first day of trading and closed at \$122.54, valuing the company at about \$3.96 billion based on 32.3 million shares outstanding.

While the market showed strong enthusiasm for the stock, Baidu's public offering generated much debate about the underlying value of the firm. Many argued that the price could not be justified by the underlying values of the firm. Others argued that the company would not be able to sustain the growth investors implicitly were expecting after the IPO.

This session apply the various approaches to valuation developed in the previous two sessions to the company's stock to evaluate its price, emphasizing the linkage between the robustness of the company's competitive strategy in relation to the future potential of the firm to generate growth in cash flows.

### **Objectives**

- To develop participants skills at applying valuation concepts and tools.
- To highlight the challenges of evaluating competitive strategies of young companies in emerging industries.
- To enhance the ease with which participants will be able to distinguish between marketing hype, general market madness, and the real potential of firms to create value.



## **Syllabus Segment 26: Leading Teams and Groups (Thread Intervention)**

Time: 2-3 hours

Responsible: Pete Dominick

Support: TBD

Speaker: Pete Dominick

Materials: Slides, Possibly - Polzer (2004). *Army Crew Team Case*, Harvard Business School Publishing.

### **Summary**

This module will include lecture, as well whole class and small group discussions to introduce participants to fundamental models for understanding, diagnosing and improving team health and dynamics. The key models we'll explore are the Inclusion, Control and Affection, framework (Bennis & Shepard), the Five dysfunctions model (Lencioni) and the core concerns framework (Fischer & Shapiro). We will explore these models in relation to a case example and through having participants apply these concepts to the teams they lead and work on.

### **Objectives**

- Become familiar with different models for diagnosing and improving team health and dynamics
- Understand the important role that conflict plays in team functioning and become familiar with one framework (the emotional concerns framework ) for leveraging it.
- Use a team process model to describe strengths and improvement areas for teams they lead or are a part of.

## Syllabus Segment 27: Enhancing Your Buying Power - Continued (Project)

Time: 0.5 hours

Responsible: Ralph Giffin

Support: Val Gavito

Speaker: TBD

Materials: Slides

Readings: TBD

Assignment: Students will create a presentation to address the project.

### Summary

Students will be asked to synthesize and reflect on what they have learned in 350B and demonstrate how this learning experience and newly gained knowledge might impact their ability to perform in their current positions. They will be asked to do this via a group exercise which will take place across the week with time at the end of each day devoted to reflect on the day's topics and identify ways in which what they have learned can be translated into outcomes which will enhance their buying power as government acquisition professionals. Finally, they will be asked to package and deliver their findings to at least two different constituent types (receivers) demonstrating their understanding and use of various supportive communication and influence principles introduced in this course.

### Objectives

- Identify how 350B learning outcomes can be translated into enhanced on-the-job performance
- Demonstrate the ability to create clear and concise messaging and the ability to utilize various supportive communication and influence principles via a presentation to different constituent types (receivers).
- Demonstrate the ability to create a credible and impactful plan which gains buy-in from stakeholders.

Supportive Communication Principles by Receiver type	Communicating to Peer	Communicating to Customer	Communicating to Team	Communicating to Senior Exec
Influence Tactics				
Interpersonal Style				
Attention Span				

Table 1 – Communication Intersections

## Syllabus Segment 28: Presentations (Group Project)

Time: 2 hours

Responsible: All

Support: TBD

Speaker: TBD

### Summary

Students will be asked to synthesize and reflect on what they have learned in 350B and demonstrate how this learning experience and newly gained knowledge might impact their ability to perform in their current positions. They will be asked to do this via a group exercise which will take place across the week with time at the end of each day devoted to reflect on the day's topics and identify ways in which what they have learned can be translated into outcomes which will enhance their buying power as government acquisition professionals. Finally, they will be asked to package and deliver their findings to at least two different constituent types (receivers) demonstrating their understanding and use of various supportive communication and influence principles introduced in this course.

### Objectives

- Identify how 350B learning outcomes can be translated into enhanced on-the-job performance
- Demonstrate the ability to create clear and concise messaging and the ability to utilize various supportive communication and influence principles via a presentation to different constituent types (receivers).
- Demonstrate the ability to create a credible and impactful plan which gains buy-in from stakeholders.

Supportive Communication Principles by Receiver type	Communicating to Peer	Communicating to Customer	Communicating to Team	Communicating to Senior Exec
Influence Tactics				
Interpersonal Style				
Attention Span				

Table 1 – Communication Intersections

### **Syllabus Segment 29: Feedback and Close (Course Assessment)**

Time: 0.5 hours

Responsible: Nicole Hutchison

Support: TBD

Speaker: TBD

#### **Summary**

The students will be asked to provide feedback on the course, including on the general content, the applicability of content to acquisition, and their (perceived) ability to apply the methods, techniques, and principles learned in their current organizational roles.

#### **Objectives**

- Provide students' with feedback on their performance for the group project (as a group).
- Collect student impressions of the course (benefits, areas for improvement).

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## F.2 SYS350C STORYBOARDS

### SYS350C: Systems Engineering Technical Leadership Enterprise Lens

#### Syllabus Segments

0. Readings: [Explanation of Reading Assignments](#)

#### **Day 1**

1. [Welcome & Course Overview](#)
2. [The Technical Enterprise – Descriptions & Interactions](#)
3. [Understanding Your Enterprise & That of Your Stakeholders](#)
4. [SYS350B Group Project Overview: Enhancing Buying Power](#)

#### **Day 2**

5. [Creating Value in the Multi-Business Enterprise](#)
6. [Capturing Value in the Multi-Business Enterprise](#)
7. [Enterprise Engineering, Technology, and Process](#)
8. [Building Readiness for Enterprise Change](#)
9. [Group Project](#)

#### **Day 3**

10. [Enterprise Engineering, Technology, & Process II](#)
11. [Technology Acquisition for the Enterprise](#)
12. [Enterprise Leverage of Engineering & Technology](#)
13. [Tools for Leading Enterprise Change](#)
14. [Group Project](#)

#### **Day 4**

15. [The Senior Technical Leader: Leading at the Enterprise Level](#)
16. [The Senior Technical Leader: Effectively Communicating at 360°](#)
17. [Leading Enterprise Professional Development](#)
18. [You as an Enterprise Change Agent](#)
19. [Group Project](#)

#### **Day 5**

20. [Student Presentations](#)
21. [Feedback](#)

## Explanation of Reading Assignments

The following is the list of readings/assignments for SYS350C. Please note that the topics are listed under the *day they will be discussed*. The pre-readings are optional, but will help students have better context for the in-class materials.

### Pre-Reading

Jon Katzenbach and Ashley Harshak. "Stop Blaming your Culture." Strategy+Business, Booz & Co., Spring 2011, Issue 62, pp. 35-43. Reprint # 11108 <http://www.strategy-business.com/article/11108> (PDF emailed)

"Why Culture is Key: The Global Innovation 100." Strategy+Business, Booz & Co., Winter 2011, Issue 65, pp. 31-45. Reprint # 11404 <http://www.strategy-business.com/article/11404> (PDF emailed)

"Boundary Spanning Leadership." Center for Creative Leadership (CCL). <http://www.ccl.org/leadership/pdf/research/BoundarySpanningLeadership.pdf> (PDF emailed)

Koller, Goedhart, and Wessels. "Chapter 19," Valuation (5th Edition). John Wiley & Sons, Hoboken, NJ, 2010). (PDF emailed)

### Monday

"Cultivating Organizational Creativity in an Age of Complexity: A companion study to the IBM 2010 Global Chief Human Resource Officer Study." IBM Institute for Business Value 2011. <http://www-935.ibm.com/services/us/en/c-suite/ceostudy2012/> (PDF emailed)

### Tuesday

John E. Jones and William L. Bearley. Change Reaction Inventory: "Change Reaction: Understanding your response to organizational change." April 2011. [www.hrdq.com](http://www.hrdq.com) (To be handed out in class)

Anand, Collis, and Hood. "Danaher Corporation." *Harvard Business School Case Study*. (To be handed out in class)

### Corporate Positions

- Boeing. Available at: [www.boeing.com/companyoffices/aboutus/overview/powerpoint/boeing\\_overview.ppt](http://www.boeing.com/companyoffices/aboutus/overview/powerpoint/boeing_overview.ppt)
- General Dynamics. Available at: [www.gd.com/about/corporate-overview/](http://www.gd.com/about/corporate-overview/)
- Lockheed Martin. Available at: [www.seekingalpha.com/article/283111](http://www.seekingalpha.com/article/283111)

### **Wednesday**

Iansiti and Herman. "CA Technologies: Bringing the Cloud to Earth." Harvard Business School Case Study. June 2011. (To be handed out in class)

*HBR Change Simulation: Harvard Business Publishing Change Management Simulation: Power and Influence Online Simulation* 3295 Rev. June 23, 2011.

To prepare, you please go to <http://cb.hbsp.harvard.edu/cb/access/15718174> and follow the instructions to create a login and password for access to the simulation called "Change Management: Power and Influence" for our course, 350C.

Please open the "run simulation" link on the bottom right of the login page and go to the "prepare tab" as well as other materials before class on Tuesday October 2. Be sure to download the course pack (this has been pre-paid by Stevens).

Once everyone has created a login, Pam will assign each person to a scenario. Pam will let you know when that happens because additional info about your role will appear the next time you log in. We'll also have time in class to review and answer questions. If you have questions before the course starts, contact Pam Burke [pburke78@comcast.net](mailto:pburke78@comcast.net) or (732) 671-2243.

### **Thursday**

"Learning about Learning Agility." Center for Creative Leadership (CCL). 2012.  
<http://www.ccl.org/leadership/pdf/research/LearningAgility.pdf> (PDF emailed)

*The following books will handed out in class. They will be discussed in general, but students are not expected to read them in full during the pilot:*

Angier. *The Canon: A Whirligig Tour of the Beautiful Basics of Science*. Boston, MA: Houghton Mifflin Company.

Sheehan. *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon*. Random House.

### **Friday**

*Friday consists of student presentations and feedback. There will be no reading assignments.*

## Syllabus Module M-1.0: Welcome & Course Overview (lecture)

Time: 0.75 hours

Responsible: Gavito

Support: Hutchison, Burke, Guth, Reinisch, Giffin

Presenter: Gavito

Materials: Slides

Readings: N/A

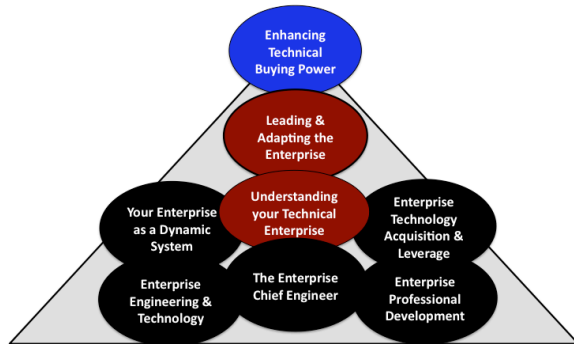
Assignment: N/A

### Summary

This segment will initially introduce the Students and faculty and then the students will be asked to briefly describe any leadership action or initiative they performed which was influenced by SYS350A or 350B. The segment will continue with a review of the SYS 350 three-lens architectural approach, the complementary relationships of 350C with 350A and 350B, and an overview of 350C course objectives, focus areas, and syllabus.

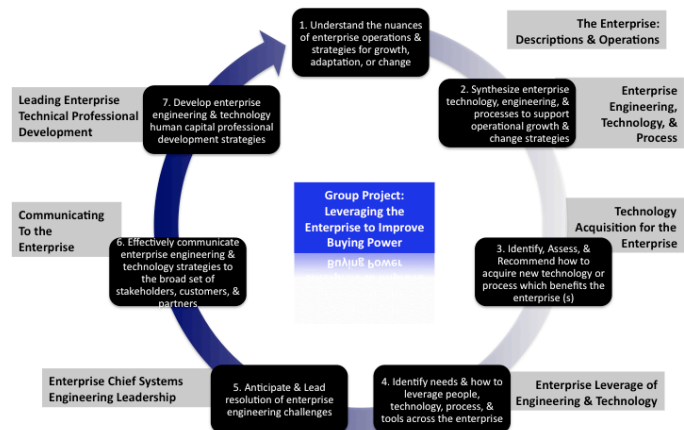
### Objective

The objective of this segment is to provide a clear understanding of the 350C objectives and syllabus plan, adjust or tailor the syllabus plan as appropriate to setup 350C learning, and show how the focus areas support an extension to student's technical buying power leadership portfolio.



### Support to Course Objectives

This module will describe the course objectives and focus areas.





## **Syllabus Module M-2.0: The Technical Enterprise – Descriptions & Interactions**

Time: 0.75 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Enterprise Questionnaire Handout after the lecture

Readings: N/A

Assignment: N/A

### **Summary**

This module will frame Enterprises in terms of definition, form, characteristics, and dynamics to baseline the student's mental and physical models of their own Enterprise for subsequent 350C learning. Key learning points include:

Present, discuss, and agree to a working definition of an Enterprise.

Discuss how Enterprises are formed a) by design, b) by collaborative adaptation, and c) by known or unknown consequence.

Discuss two types of Enterprises a) Enterprises as structured systems comprised of organizational nodes, connections, inputs, outputs and b) Enterprises as activity based systems.

Discuss the characterization of Enterprises from a) 'Inside-Out' starting with you as a technical leader then expanding out to your sphere of accountability and responsibility and b) 'Outside-In' starting with the Enterprise elements in your sphere of accountability and responsibility then progressing in towards you as a technical leader.

Present and discuss three Enterprise examples to include a) an (Industry Structure) Aerospace and Defense company, b) a (Government Structure) DoD Agency or technology related Command, and c) a (Technical Development Activity) Research and Development project.

The module will conclude with students constructing their respective structural Enterprise model to be used for expanded leadership 'thread' and 350C focus area learning.

### **Objectives**

The objectives of this segment are to

- expand the student's perspective of the broad sets of Enterprises to support convergence to a model of their own Enterprise,
- apply the learning to construct a working model of their own Enterprise, and
- initiate student thinking of the dynamic forms of their Enterprise to support their Group Project activities and subsequent 350C learning.

### **Support to Course Objectives**

This module will provide a basis of Enterprise definition and dynamics to support learning objectives of the lectures and exercises within the Enterprise Description and Operations, Enterprise Leverage of Engineering and Technology, Enterprise Chief Engineer, and communicating to the Enterprise focus areas and the Group Project activities. Additionally, this

module will provide the student with an Enterprise model to further examine the behavioral aspects of Enterprises for the purpose of adaptation and change.

## **Syllabus Segment M-3.0: Understanding Your Enterprise & That of Your Stakeholders (Interactive Lecture, Group Activities)**

Time: 2.5 hours

Responsible: Pamela Burke, PhD

Support:

Presenter: Pamela Burke, PhD

Materials: slides, PDFs, video of Dr. Hans Trompenaars -- Model of Corporate Cultures, Video of Dr. David Logan -- TEDX talk on Tribal Leadership

### **Readings**

1. Stop Blaming your Culture. Jon Katzenbach and Ashley Harshak. Strategy+Business, Booz & Co., Spring 2011, Issue 62, pp. 35-43. Reprint # 11108 <http://www.strategy-business.com/article/11108>

2. Why Culture is Key: The Global Innovation 100. Strategy+Business, Booz & Co., Winter 2011, Issue 65, pp. 31-45. Reprint # 11404 <http://www.strategy-business.com/article/11404>

Assignment: None

### **Summary**

This segment introduces the value of identifying the major functional groups within an enterprise and their key stakeholders in order to build relationships, influence change, and overcome obstacles across boundaries and organizational cultures. Students create an enterprise map showing how the groups in their organization interact with key stakeholders. They then select a stakeholder who they perceive as having a very different organizational culture from their home organization and develop strategies for 1) better understanding the stakeholder's culture, and 2) Identifying key differences that a leader needs to address in order to communicate effectively across these organizational cultures. Interactive mini-lectures include information on assessing organization cultures, research on four general types of organizational cultures, and the role of leaders in being translators/ influencers across organization cultures, and the value of advancing collaborative webs.

This segment sets up the remaining "thread" topics where we go deeper into what leaders do to influence change in an organization and how they build the capacity for change and cross-organization collaboration and communication into the culture.

### **Group Activities:**

1. Enterprise organizational map and stakeholders - collaborative webs
2. Assessing a culture -- anthropology walk
3. Beliefs and assumptions about our own culture -- class agree-disagree continuum
4. Cracking the culture code of a key stakeholder -- interview design

## **Objectives**

- Understand the "big picture" of the groups that make up an enterprise and why it is important to examine the cultures of different stakeholders in order to be strategic about relationships, influence, and collaboration.

## **Support to Course Objectives**

The Enterprise: Understand the nuances of enterprise operations & strategies for growth, adaptation, or change

Enterprise Communication: Effectively communicate enterprise engineering & technology strategies to the broad set of stakeholders, customers, & partners

## **Syllabus Module M-4.0: SYS350B Group Project Overview: Enhancing Buying Power**

Time: 1.0 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Handouts

Readings: N/A

Assignment: Daily assignments will be distributed via handouts.

### **Summary**

This module will provide an overview of 350C Group Project.

### **Objectives**

- Prepare the students for leveraging the 350C learning to support develop and present a recommended Enterprise Buying Power Initiative.
- The operational concept for the project consists of daily group activities facilitated by a set of questions and assignments to stimulate Enterprise level leadership learning. Days 1 through 3 (Monday through Wed) activities focus on Enterprise Definitions, initiative assessments, and preparing the Enterprise for change. Day 4 (Thursday) is dedicated to buying power initiative finalization and development of the group presentation. Group Presentations will then be conducted on Day 5 (Friday).

The daily discussions and assignments are noted below.

### **Day 1: Defining the Enterprise (60 min)**

Discuss the range and domain of an Enterprise in terms of what makes the best framework for enhancing technical buying power. Think of range as the horizontal and vertical Enterprise 'extensions'. Think of domain as the 'spheres of activity' for an Enterprise.

Draw a system representation of your selected Enterprise that reflects the predominant or primary organizational entities and activities of your enterprise.

Using your enterprise representation, identify the spheres of direct control and influence and any associated spheres of indirect control and influence which are resident if you had to bring about a cross-entity or cross-enterprise change required to enhance your buying power.

**Syllabus Module T-1.0: Creating Value in the Multi-Business Enterprise (lecture)**

Time: 1.5 hours  
Responsible: Guth  
Support: Gavito, Giffin  
Presenter: Guth  
Materials:  
Readings: N/A  
Assignment: N/A

**Summary**

Many firms compete in more than one industry/business. In their drive for increasing shareholder value, managers of firms often believe that broadening the product/market scope of the firm will provide them with greater opportunity to grow earnings (free cash flow), and increase return on invested capital than would be provided by staying within the boundaries of their current businesses. In addition, business managers believe that investing in a broader rather than narrower range of businesses can – but doesn't necessarily – "smooth" earnings by diversifying the industry structure and business cycle risks they face in the firm's current businesses.

Historically, the principal means of expanding the product/market scope of a firm have been by merging with other firms, or by acquiring other firms. Either way, the firm expanding its product market scope must invest in the assets of the firms it merges with or acquires. In the case of firms to be merged or acquired that are publically held, the financial markets have valued the assets of the firms to be assimilated, reflecting that value in the price of their common stock. Rarely if ever will a firm be able to expand its product/market scope by merger or acquisition of assets at a price less than what the market has set, and most often, will have to pay a premium over that market price to obtain shareholder acceptance, and to win against other potential bidders.

Thus, for the firm striving to create value for shareholders by expanding its product/market scope, it must be able to increase the free cash flows and/or ROIC obtainable from the assets it merges with or acquires above what the market currently projects they will be, based on historical performance and evaluation of the competitive strategy determining their deployment. In other words, the assets being merged with or acquired **MUST** be more valuable being part of the larger firm than they were on their own – **AND**, more valuable than they would be if they had been merged with or acquired by yet another firm.

Multi-business enterprise strategy defines where how value will be created by the firm in expanding its product/market scope. In addition, it defines how that value will be captured by the firm's organization structure, processes, systems and culture.

## Objectives

- To develop the analytics of value creation in a multi-business enterprise.
- To understand why we have multi-business corporations, and what the limits are on their value-creating expansion.
- To critically examine why a very high proportion (70-85%) of mergers and acquisitions destroy rather than create value.
- To explore the value of understanding multi-business enterprise strategy in relating to firms as buyers of their products and/or services.

**Syllabus Module T-2.0: Capturing Value in the Multi-Business Enterprise**

Time: 1.0 hour  
Responsible: Guth  
Support: Gavito, Giffin  
Presenter: Guth  
Materials:  
Readings: N/A  
Assignment: N/A

**Summary**

In order to capture the potential value created by expanding the product/market scope of the firm, the firm's management must design an organization structure, a set of management processes and systems, and shape an organizational culture that encourages and supports internal leveraging and sharing of resources. The foundational organizational building block of the multi-business enterprise is the "strategic business unit (SBU)" These "strategic business units" are given profit and loss responsibility, and are typically managed by a managing director, and a staff of functional specialists in the fields of marketing, operations, finance, and research and development. Major issues to be addressed and decided upon are: 1) how autonomous should the SBU's be?, 2) which of the functions should be centralized in the home office, versus being performed in the SBU?, 3) what coordinating mechanisms (e.g., committees, meetings, etc.) should be used to foster leveraging and sharing of resources across SBU's, 4) how can the firm encourage the crossing of organizational boundaries to leverage and share resources.

This segment will analyze the consequences of alternative choices managers might make in addressing these major issues. The session will end with a discussion of the organizational requirements to be effective in managing the technical resources of the firm, under different multi-business enterprise strategies.

**Objectives**

- To analyze the governance requirements for effective multi-business enterprise strategies.
- To introduce the concepts of organization structure, processes, systems and culture.
- To analyze the major governance choices facing managers of multi-business enterprises.
- To discuss how understanding the governance requirements for effective multi-business enterprise strategies can enhance the buying power of those.



## Syllabus Module T-2.1: Discussion of Danaher Corporation Case

Time: 0.75 hours

Responsible: Guth

Support: Gavito and Giffin

Discussion Leader: Guth

Materials: Danaher Case Study

Readings: N/A

Assignment: N/A

### Summary

This case presents the formulation and development of the multi-business enterprise strategy of Danaher Corporation from 1985 to 2010. It is classified by many analysts as a “conglomerate corporate strategy.” This is a strategy that requires minimal linkages between strategic business units. In general, this type of multi-business enterprise strategy has a dismal record of performance in the many companies that have adopted it in the US, particularly in the 1970’s and 1980’s. Yet, Danaher’s management has thus far achieved outstanding performance with its strategy. The case compels participants to search carefully for how Danaher both creates value and captures it in its acquisitions. In addition, it raises important questions about the limits of firm growth through expansion of its product/market scope.

### Discussion Questions

- How does Danaher add value to the businesses in its portfolio?
- How important to its corporate advantage is the Danaher Business System (DBS)?
- What exactly is the DBS? What type of resource is it? Is it a technology? Can it be imitated? Do you agree with Larry Culp that “the real value of Danaher lies in the accumulated experience of operating with DBS, no one else has 20 years of experience with our system”?
- From 1992 to 2006, Danaher achieved “compound annual organic growth of 5%, and total growth of 18%.” (p. 13). If it maintains that rate of growth, what will be its net profit in 2015? How much of that profit would come from acquisitions in 2015? What is your estimate of how much Danaher would have to invest in acquisitions in 2015?
- Can Danaher achieve 5% organic growth indefinitely?
- Larry Culp does not appear worried about competition from private equity firms in making acquisitions (p. 14). Do you agree with the analysis leading to his conclusion not to worry?

## **Syllabus Module T-3.0: Enterprise Engineering, Technology, and Process (lecture)**

Time: 1.25 Hours

Responsible: William Reinisch

Support: None

Presenter: William Reinisch

Materials: Slides

Readings: TBD

Assignment: None

### **Summary**

This section provides an introduction to the engineering, technology and the processes used to manage technical organizations. We will present and discuss technology and business approaches for the enterprise. We will also discuss the issues that businesses face in planning and managing technical organizations at an enterprise level.

### **Objective**

- To develop an awareness of the range, scope, and complexity of the issues and problems that an enterprise faces in the management of technology.
- Relate strategic management of technology and engineering to the overall enterprise for the system engineer.
- To develop a basic understanding of the management tools and processes that can be used to manage technology at an enterprise level.
- Discuss the skills and techniques and processes that an enterprise can utilize to gain a competitive advantage for the overall organization.
- We will discuss the intra and inter enterprise components of an enterprise technology strategy.
- To review some of the tools and concepts used by enterprises that are working in technology intensive industries.
- To offer some practical framework for defining strategic management of technology at an enterprise level.

### **Support to Course Objectives**

Synthesize engineering and technology needs and investment strategies, objectives, and plans to support growth, adaptation, or change objectives.

## **Syllabus Module T-4.0: Building Readiness for Enterprise Change (Interactive Lecture, Group Activities, Self-Reflection Inventory)**

Time: 2.0 hours

Responsible: Pamela Burke, PhD

Support:

Presenter: Pamela Burke, PhD

Materials: slides, PDFs, Change Reaction Inventory

Readings: None

Assignment: Complete the Change Reaction Inventory

### **Summary**

Leading organization change is a strategic necessity and a human process. This segment encourages students to identify current and potential sources of planned and unplanned change that affect their enterprise and the enterprise of a key stakeholder. Students use the William Bridges model of transitions to reflect on their personal reactions to a recent organizational or personal change. In groups, students select a change that is underway in their enterprise and use the Change Reaction Inventory to identify possible reactions and leader actions that could accelerate positive change. Interactive lecture segments include models of planned and unplanned change, the Bridges model of transitions, and organizational approaches to building resilience and diminishing resistance to change.

### **Group Activities**

“What's changing?” exercise

Personal reactions to change exercise

The *Change Reaction Inventory* - personal preferences and patterns in your culture

### **Objectives**

- Practice identifying internal and external changes that may affect the enterprise and its stakeholders so that a planned approach to building support for a change is possible
- Become more aware of your own reactions to change and how your reactions affect the people you lead
- Be able to discuss the basics of organizational change with teams and stakeholders so that you can jointly create and support important, sometimes difficult changes

### **Support to Course Objectives**

Professional Development leader: Develop enterprise engineering & technology human capital professional development strategies

Enterprise Leverage: Identify needs and how to leverage people, technology, process, and tools across the enterprise

The Enterprise: Understand the nuances of enterprise operations & strategies for growth, adaptation, or change

## Syllabus Module T-5.0: Group Project

Time: 1.0 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Handouts

Readings: N/A

Assignment: Daily assignments will be distributed via handouts.

### Summary

This module will provide an overview of 350C Group Project.

### Objectives

- Prepare the students for leveraging the 350C learning to support develop and present a recommended Enterprise Buying Power Initiative.
- The operational concept for the project consists of daily group activities facilitated by a set of questions and assignments to stimulate Enterprise level leadership learning. Days 1 through 3 (Monday through Wed) activities focus on Enterprise Definitions, initiative assessments, and preparing the Enterprise for change. Day 4 (Thursday) is dedicated to buying power initiative finalization and development of the group presentation. Group Presentations will then be conducted on Day 5 (Friday).

The daily discussions and assignments are noted below.

### Day 2: Enterprise Initiative Analysis & implementing Enterprise Change (60 min)

Identify an Enterprise buying power problem or deficiency.

Develop an Enterprise better buying power initiative statement.

What is the Enterprise Value Proposition of the initiative?

What are the probable effects on your own Value Proposition?

What are the major elements of your Enterprise Strategy for the initiative?

What cross-enterprise changes are needed to implement the strategy? How would you persuade members of your Enterprise to investigate, propose, and implement a cross-enterprise change that would positively enhance your buying power objective? (For example, what strategic actions to be taken both in and across the spheres of direct control and influence to gain buy-in for the initiative?)

## **Syllabus Module W-1.0: Enterprise Engineering, Technology, & Process II (lecture)**

Time: 1.5 Hours

Responsible: William Reinisch

Support: None

Presenter: William Reinisch

Materials: Slides

Readings: TBD

Assignment: None

### **Summary**

This section will continue to provide more details on how the engineering, technology and processes can be used to manage technical organizations. We will further present and discuss technology and business approaches for the enterprise. We will continue to discuss the issues that businesses face in planning and managing technical organizations at an enterprise level.

### **Objectives**

- To further discuss the range, scope, and complexity of the issues and problems that an enterprise faces in the management of technology.
- To continue to relate strategic management of technology and engineering to the overall enterprise for the system engineer.
- To develop a further understanding of the management tools and processes that can be used to manage technology at an enterprise level.
- We will discuss some of the specific intra and inter enterprise techniques that are used as part of an enterprise technology strategy.
- To review some of the tools and concepts used by enterprises that are working specifically in service related technology intensive industries.
- Discuss the importance of the Strategy and people to ensure an optimal Enterprise.
- To continue to offer a practical framework for defining strategic management of technology at an enterprise level.

### **Support to Course Objectives**

Synthesize engineering and technology needs and investment strategies, objectives, and plans to support growth, adaptation, or change objectives.

Effectively act as the stakeholder and owner of strategically aligned enterprise engineering.

## **Syllabus Module W-2.0: Technology Acquisition for the Enterprise (lecture)**

Time: 1.5 Hours

Responsible: William Reinisch

Support: None

Presenter: William Reinisch

Materials: Slides

Readings: TBD

Assignment: None

### **Summary**

This section provides an introduction to how an enterprise thinks about, manages, and executes technology-based acquisitions. We will focus on the critical roles that the technical leaders play in this function. We will also discuss some of the issues that enterprises face in both acquiring and integrating highly technical organizations. We will also discuss the challenges of integration along with managing and communicating during these periods.

### **Objective**

- Review why technical organizations might acquire other technical organizations.
- Understand technical acquisition strategies.
- To develop an awareness of the range, scope, and complexity of the issues and problems that an enterprise faces with technical based acquisitions.
- To review the role of technical due diligence in relation to the other enterprise processes.
- Relate strategic technical acquisitions to the system engineer and the overall enterprise organization.
- Discuss the challenges of post acquisition integration from the technical viewpoint.
- To offer some practical frameworks for determining the role of technology based acquisitions to the enterprise organization.

### **Support to Course Objectives**

Independently lead teams to develop enterprise technology acquisition strategies in support of organizational and business objectives.

Synthesize engineering and technology needs and investment strategies, objectives, and plans to support growth, adaptation, or change objectives.

## **Syllabus Module W-2.1: CA Technologies: Bringing the Cloud to Earth (Case Study)**

Time: 0.5 Hours

Responsible: William Reinisch

Support: None

Presenter: William Reinisch

Materials: Case Document

Readings: "CA Technologies: Bring the Cloud to Earth", HBR Case Study

Assignment: Read the Case Document

### **Summary**

This section will review and reinforce the critical importance of understanding, managing and communicating a technology acquisition strategy through an interactive discussion of the CA Technologies: Bringing the Cloud to Earth case study.

### **Objective**

- Students will be expected to pre-read the CA Technologies: Bringing the Cloud to Earth case study.
- Students will then be asked questions in the class to hone their ability and improve their understanding of the critical importance and skills that face technical leader when positing and communicating new technology strategy based on acquisitions.
- Support to Course Objectives
- Independently lead teams to develop enterprise technology acquisition strategies in support of organizational and business objectives.
- Effectively communicate technology assessments and recommended responses to senior operational executives.
- Effectively communicate enterprise engineering and technology strategies to the broad set of enterprise stakeholders, customers, and prospective enterprise partners.
- Effectively act as the stakeholder and owner of strategically aligned enterprise engineering.
- Synthesize engineering and technology needs and investment strategies, objectives, and plans to support growth, adaptation, or change objectives.

## **Syllabus Module W-3.0: Enterprise Leverage of Engineering & Technology (lecture)**

Time: 1.0 Hours

Responsible: William Reinisch

Support: None

Presenter: William Reinisch

Materials: Slides

Readings: TBD

Assignment: None

### **Summary**

This section provides an introduction to how the system engineer can help to leverage the technology and engineering functions as part of the overall business needs of the enterprise. We will focus on the most significant and valuable points of leverage for the overall organization. We will also discuss how to align the engineering and technology needs, processes, and tools to the most important needs of the enterprise.

### **Objective**

- To develop a basic understanding of how the technology and engineering functions can provide overall leverage to an enterprise.
- To develop an awareness of the range, scope and complexity of the issues that the technology and engineering functions can cause to the enterprise and its organizations.
- To review the role of the technology functions for the value creation for the overall organization.
- Relate specific examples of the significance and importance of technical and engineering functions within the high technology sector.
- To offer some practical frameworks for determining the appropriate role of the leverage of technology to the overall enterprise organization.

### **Support to Course Objectives**

Effectively communicate enterprise engineering and technology strategies to the broad set of enterprise stakeholders, customers, and prospective enterprise partners.

Synthesize engineering and technology needs and investment strategies, objectives, and plans to support growth, adaptation, or change objectives.



## **Syllabus Segment W-4.0: Tools for Leading Enterprise Change (online simulation)**

Time: 2.5 hours

Responsible: Pamela Burke, PhD

Support:

Presenter: Pamela Burke, PhD

Materials: slides, PDFs, HBR Change Simulation: *Harvard Business Publishing Change Management Simulation: Power and Influence Online Simulation 3295 Rev. June 23, 2011*

Reading: None

Assignment: Prepare by viewing the user interface video, read the background of the company, and become familiar with the purpose and operation of the simulation

### **Summary**

In this segment, students perform an online simulation to test and extrapolate principles for leading strategic organization-wide change. Students, acting as either the director of product innovations in a specialty glass company or the company CEO must gain acceptance and commitment to a company-wide change initiative on sustainability. Working alone or in pairs, students make choices to navigate the mobilization, movement, and sustaining phases of organization change while getting as many employees as possible through the change stages of awareness, interest, trial, and adoption. They have 18 change "levers" to use in order to gain credibility, communicate effectively, train associates, initiate structural/technical support for changes, make use of political tactics, and create cultural support for the changes.

### **Group Activities**

1. Online-change simulation and debrief (Note: once purchased, students can re-run the simulation in other roles and conditions on their own for up to six months.)

### **Objectives**

- Practice strategic change leadership skills: diagnosis, action planning, implementation
- Increase skill in using social-network/ relationship skills in leading change, especially in conditions of low power or authority
- See the results of choosing change strategies and their timing
- Learn the potential effects of common missteps when leading organization change

### **Support to Course Objectives**

Professional Development leader: Develop enterprise engineering & technology human capital professional development strategies

Enterprise Leverage: Identify needs and how to leverage people, technology, process, and tools across the enterprise

Enterprise Communication: Effectively communicate enterprise engineering & technology strategies to the broad set of stakeholders, customers, & partners

The Enterprise: Understand the nuances of enterprise operations & strategies for growth, adaptation, or change.

### **Syllabus Module W-5.0: Group Project**

Time: 1.0 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Handouts

Readings: N/A

Assignment: Daily assignments will be distributed via handouts.

#### **Summary**

This module will provide an overview of 350C Group Project.

#### **Objectives**

- Prepare the students for leveraging the 350C learning to support develop and present a recommended Enterprise Buying Power Initiative.
- The operational concept for the project consists of daily group activities facilitated by a set of questions and assignments to stimulate Enterprise level leadership learning. Days 1 through 3 (Monday through Wed) activities focus on Enterprise Definitions, initiative assessments, and preparing the Enterprise for change. Day 4 (Thursday) is dedicated to buying power initiative finalization and development of the group presentation. Group Presentations will then be conducted on Day 5 (Friday).

The daily discussions and assignments are noted below.

#### **Day 3: Enterprise Change Strategy Group Discussions (60 min)**

What are the enterprise drivers for the cross-entity change? (E.g. Strategy, Finance, Industry Changes, New Collaboration Opportunities...)

Using your Enterprise System representation, identify the enterprise entities that are currently affected by the Enterprise buying power problem.

How do organizational cultures currently affect the buying power problem?

What entities contribute to and/or are affected by the solution or solution-generating process?

How does the proposed solution (or proposed process for obtaining a solution) work with or against attributes of the current culture(s)?

How might the next steps in your plan build new culture attributes that will serve the organization going forward?

What key challenges do you see in creating this change?

Identify potential key change agents (including yourselves) and recommended leadership actions they will need to take to investigate, propose, and implement this cross-entity change to affect the buying power initiative.

What barriers, if any, are there to achieving effective coordination across organizational boundaries to capture these opportunities? How can these barriers be overcome or minimized?

## **Syllabus Module H-1.0: The Senior Technical Leader: Leading at the Enterprise Level (lecture)**

Time: 1.5 hours

Responsible: Ralph Giffin

Support:

Presenter: Ralph Giffin

Materials: (slides, videos, case studies, hard-copy materials)

Readings: Seehan, Neil. *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon*, Random House (2009), ISBN-10: 0679422846

Assignment: (Pending)

### **Summary**

Leading versus managing – team versus business versus enterprise

Understanding power, how to recognize it, and how to leverage for effective leadership

Student Activity: Identify the sources of power in an enterprise

What is different for the technical leader?

Leadership style, behavior and philosophy

Effectively leading through the nuances of the enterprise

Pitfalls and guarantees for failure

### **Objectives**

- Understand the Difference Between Management and Leadership
- Understand these differences at each organizational level
- Understand what is Different for the Technical Leader
- Understand Power and the Influencing of Behavior
- Understand Effective Leader Activities and Behaviors
- Understand the Enterprise as an Effective Leader
- Understand how to Effectively Fail as a Leader

### **Support to Course Objectives**

This module will attempt to give the student a prospective on leading versus managing at each level of an organization with a particular focus on the enterprise level. In addition, the student will gain insight as to what is different for the technical leader versus other, non-technical leaders within the enterprise. Many of these challenges will be explored. Finally, this module will attempt to “demystify” leadership for the technical leader by introducing him/her to effective leadership practices that are independent of organizational domain.

## **Syllabus Module H-2.0: The Senior Technical Leader: Effectively Communicating at 360° (lecture)**

Time: 1.5 hours

Responsible: Ralph Giffin

Support:

Presenter: Ralph Giffin

Materials: (Slides, Audio/Video)

Readings: Angier, Natalie. *The Canon: A Whirligig Tour of the Beautiful Basics of Science*, Houghton Mifflin Company (2007), ISBN-10: 06794228460-618-24295-3

Assignment:

### **Summary**

Importance of Communicating Effectively

Effective Communication Challenges: Enterprise

Communicating Technical Information to Non-Technical Constituents

The Impact of Non-Verbal Communication

The Art and Power of Story Telling

### **Objective**

- Understand the consequences for not communicating clearly and in a timely manner.
- Understand challenges of effectively communicating, particularly within the enterprise.
- Gain an appreciation for importance of effectively packaging technical communication for consumption by non-technical constituents.
- Appreciate the Importance and Gain an Understanding of Non-Verbal Communication
- Understand How Effective Story Telling can Enhance the Leaders Ability to Convey Important Information.

### **Support to Course Objectives**

The ability to effectively communicate up, down, and across the enterprise, as well as externally to a broad set of stakeholders, is of paramount importance for the success of any leader. The technical leader has additional challenges related to the sometimes highly technical information they must convey to non-technical individuals and groups. This module will attempt to give the student a prospective on the importance of, and how to become, an effective leader communicator across a wide variety of constituents and across the extended enterprise. A particular focus will be on, 1) the need for, and ways to, effectively convey technical information to non-technical decision makers and stakeholders; 2) the importance of understanding how and why we communicate non-verbally, and; 3) how story telling can become a powerful way for the leader to communicate to listeners and leave them with a more vivid and lasting engagement.

### **Syllabus Module H-3.0: Leading Enterprise Professional Development (Interactive Lecture, Group Activities)**

Time: 1 hour

Responsible: Pamela Burke, PhD

Support:

Presenter: Pamela Burke, PhD

Materials: slides, PDFs,

Readings: TBD

Assignment: None

#### **Summary**

In this segment, students compare exceptional personal professional development experiences and outline how they would construct a professional development strategy for their organization given the changing needs in their work.

#### **Group Activities**

1. Small groups: appreciative inquiry discussion of the best professional development experiences they have had in their careers.
2. Small groups: outline the key components of a professional development strategy that could align the organization's people with the current needs for change in the culture, behavior, and skill set.

#### **Objectives**

- Understand what leaders can do to build learning organizations where engineering and technology expertise is a key strategic asset

#### **Support to Course Objectives**

Professional Development leader: Develop enterprise engineering & technology human capital professional development strategies.

Enterprise Leverage: Identify needs and how to leverage people, technology, process, and tools across the enterprise.

The Enterprise: Understand the nuances of enterprise operations & strategies for growth, adaptation, or change.

## **Syllabus Module H-4.0: You as an Enterprise Change Agent (Interactive Lecture, Group Activities)**

Time: 1.0 hours

Responsible: Pamela Burke, PhD

Support:

Presenter: Pamela Burke, PhD

Materials: slides, PDFs,

Readings: None

Assignment: None

### **Summary**

In this segment, students learn and apply Kurt Lewin's force field analysis model to an opportunity for change that they believe is important in their organization. Following the analysis, students identify two to four actions they can take to help create this change once the course is done.

### **Activities**

1. Groups of 2-4 people who see a similar opportunity to lead change in their organization perform a force field analysis and share it with the class
2. Personal reflection integrating the content from the past four days as they start an action plan for leading change

### **Objectives**

- Opportunity to integrate your thinking about being a force for change in your organization today.
- Identify an opportunity where you can apply what you've learned after class.

### **Support to Course Objectives**

Professional Development leader: Develop enterprise engineering & technology human capital professional development strategies.

Enterprise Leverage: Identify needs and how to leverage people, technology, process, and tools across the enterprise.

The Enterprise: Understand the nuances of enterprise operations & strategies for growth, adaptation, or change.

## Syllabus Module H-5.0: Group Project

Time: 1.0 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Handouts

Readings: N/A

Assignment: Daily assignments will be distributed via handouts.

### Summary

This module will provide an overview of 350C Group Project.

### Objectives

- Prepare the students for leveraging the 350C learning to support develop and present a recommended Enterprise Buying Power Initiative.
- The operational concept for the project consists of daily group activities facilitated by a set of questions and assignments to stimulate Enterprise level leadership learning. Days 1 through 3 (Monday through Wed) activities focus on Enterprise Definitions, initiative assessments, and preparing the Enterprise for change. Day 4 (Thursday) is dedicated to buying power initiative finalization and development of the group presentation. Group Presentations will then be conducted on Day 5 (Friday)

The daily discussions and assignments are noted below.

### **Day 4: Enterprise Change Presentation Development (90 min)**

*Select a target audience (e.g. cohorts, government executive, industry executive, faculty, etc.) for an overview of your Enterprise Buying Power Initiative. Develop a 20-minute presentation on your Enterprise Buying Power Initiative that addresses the salient group discussions during the week and what messages you want to convey. A list of presentation ideas for your consideration is noted below. It is desired that all members of the group participate in the presentation. Your group can choose any format such as slides, interactive discussions, skits, class activities, etc. Your creativity is welcomed.*

Your Enterprise System Diagram (nodes, connections, visible & virtual boundaries)

Your Enterprise Direct and Indirect Spheres of Control & Influence

Your Enterprise Cultural Attributes

Your Enterprise Buying Power Initiative

The Enterprise Problem

The Initiative Statement, Goals and Objectives

The Initiative's Value Propositions and Potential Effects on other Value Propositions

Enterprise Organizational Structural Influence

The Implementation Strategy

Enterprise Change Considerations

Affected Enterprise Entities

Enterprise Cultures

Key Challenges and/or Barriers for Cultural Change

Recommended Next Steps

Sharing your insights - may include insights about

Your understanding of the enterprise - current & future

Your understanding of your own skills in leading change

Your thoughts about how you personally contribute to the culture and your role in enhancing it

Anything else you learned from doing this project

What you hope the class learns from your project



## **Syllabus Module F-1.0: Student Presentations (Group Project)**

Time: 1.0 hours

Responsible: Gavito

Support: Hutchison, Burke

Presenter: Gavito

Materials: Handouts

Readings: N/A

Assignment: Daily assignments will be distributed via handouts.

### **Summary**

This module will provide an overview of 350C Group Project.

### **Objectives**

- Prepare the students for leveraging the 350C learning to support develop and present a recommended Enterprise Buying Power Initiative.
- The operational concept for the project consists of daily group activities facilitated by a set of questions and assignments to stimulate Enterprise level leadership learning. Days 1 through 3 (Monday through Wed) activities focus on Enterprise Definitions, initiative assessments, and preparing the Enterprise for change. Day 4 (Thursday) is dedicated to buying power initiative finalization and development of the group presentation. Group Presentations will then be conducted on Day 5 (Friday)

The daily discussions and assignments are noted below.

### **Day 5: Group Presentation**

The module will conclude with 20-minute Group Enterprise Buying Power Initiative presentation to the instructors and students.

### **Support to Course Objectives**

This module will afford the students to a) conduct senior technical leadership assessments of buying power deficiencies or issues in need of an Enterprise level assessment, b) develop new or modified buying power initiatives, c) discuss and recommend potential Enterprise adaptation or change required to effect the initiative, and, d) conduct an executive communication of their assessment and implementation plan to a simulated broad set of stakeholders. The students will leverage the portfolio of 350C lecture, case study, and exercise learning material presented during the week.

## **Syllabus Module F-2.0: Feedback (Administrative Segment)**

Time: 1.5 hours

Responsible: Hutchison

Support: Gavito

Presenter: Hutchison

Materials: Course Evaluation form; Instructor Project Assessment form

Readings: N/A

Assignment: N/A

### **Summary**

The students will be asked to provide feedback on the course, including on the general content, the applicability of content to acquisition, and their (perceived) ability to apply the methods, techniques, and principles learned in their current organizational roles.

Students will be asked to perform individual assessments as well as complete a group exercise to identify the key feedback from the group.

In addition, the instructors will provide feedback on the group projects to the students.

### **Objectives**

- Provide students' with feedback on their performance (as a group)
- Collect student impressions of the course (benefits, areas for improvement).